DECEMBER, 1952

# HEATING AND VENTILATING

INCLUDING AIR CONDITIONING – PIPING – REFRIGERATION – AIR SANITATION

How to Select Centrifugal Pumps Page 85

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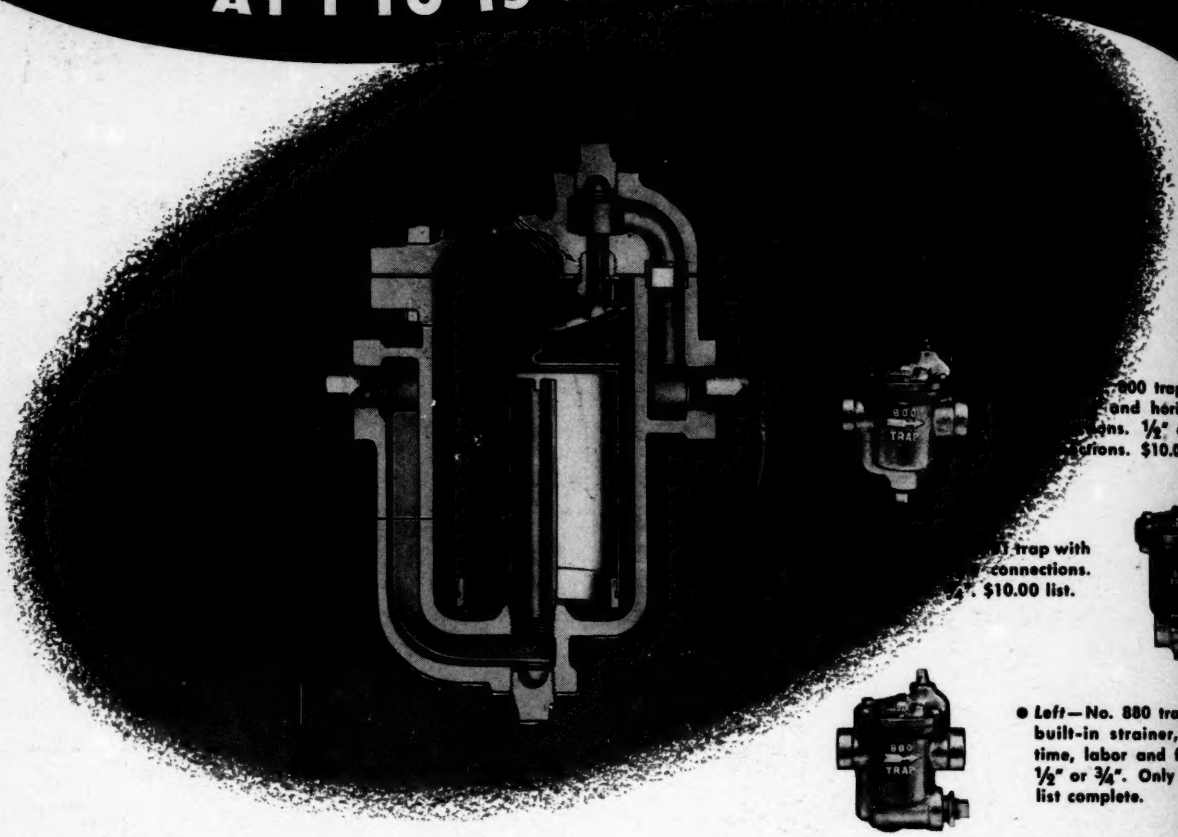
# HOW LONG WILL THIS TRAP LAST AT 1 TO 15 LBS. PRESSURE?



800 trap with and horizontal ions. ½" or ¾" rions. $10.00 list.

trap with connections. . $10.00 list.

● *Left*—No. 880 trap with built-in strainer, save time, labor and fittings. ½" or ¾". Only $11.50 list complete.

HERE'S A TRAP mechanism for low pressures that is identical in design, materials and workmanship to that used in traps for pressures to 950 lbs., temperatures to 900°F.* You know that it will last a LONG TIME with an absolute minimum of maintenance on a low pressure heating system.

**Users report: "4 to 5 years without service"..."10 years—no repairs"... "30% to 50% less maintenance."**

Add to the high quality, low maintenance features of this trap the following benefits: large air handling capacity (blast buckets with auxiliary thermic vents where you need them)... self-scrubbing action... immunity to corrosion... ease of installation—and you have an unbeatable trap for any heating job.

Call your nearby Armstrong Representative for details and prices.

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**346 Maple Street, Three Rivers, Michigan**

**Mass production of traps for all pressures makes it possible to deliver this mechanism at no premium in price.*

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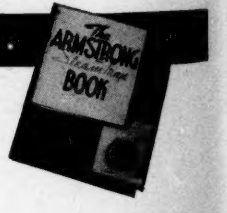
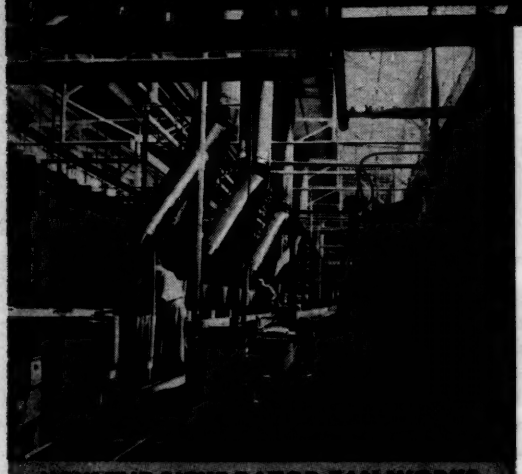



**The Armstrong Steam Trap Book gives complete catalog information on Armstrong traps, explains trap selection and installation. You are welcome to a copy.**

# ARMSTRONG STEAM TRAPS

# . . . GOODBYE TO FUME PROBLEMS



ABOVE: Four Bifurcator Roof Ventilators installed at Winters & Crampton Corporation, Grandville, Michigan. LEFT: Inside the plant, showing plating-tanks and exhaust duct work leading to roof ventilators.

**PROBLEM:** To select the best way of exhausting corrosive fumes from tanks where refrigerator and stove hardware is plated.

**SOLUTION:** Four Bifurcator Roof Ventilators installed on roof with exhaust duct work leading to them from plating tanks.

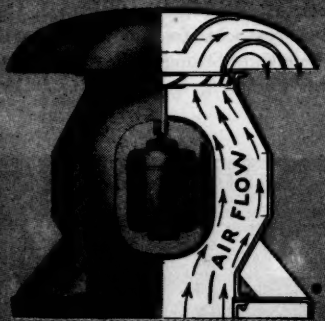
**REASONS:** "It was our choice to use this particular type of exhauster because of its simplified installation when compared to conventional centrifugal exhausters, which made it possible to omit elbows, sleeve band connections, discharge piping, and separate motor mounting and cover, which makes for a trim appearance. Ease of maintenance was also a consideration, as removal of weather top gives complete access to fan blade."

— Norman Davis, Plant Engineer
Winters & Crampton Corp.

**RESULTS:** "These four Bifurcator Roof Ventilators are doing a very satisfactory job of fume removal . . . performance is equal to, or in excess of, rated capacities."

— Norman Davis

**HOW THE BIFURCATOR FAN WORKS**




The DeBothezat Bifurcator is a direct motor-driven fan with a divided housing. Corrosive fumes are by-passed around the motor, which is mounted in a separate chamber, open to atmosphere but isolated from exhaust fumes. Bifurcator Roof Ventilators are equipped with weatherproof head and mounting base.

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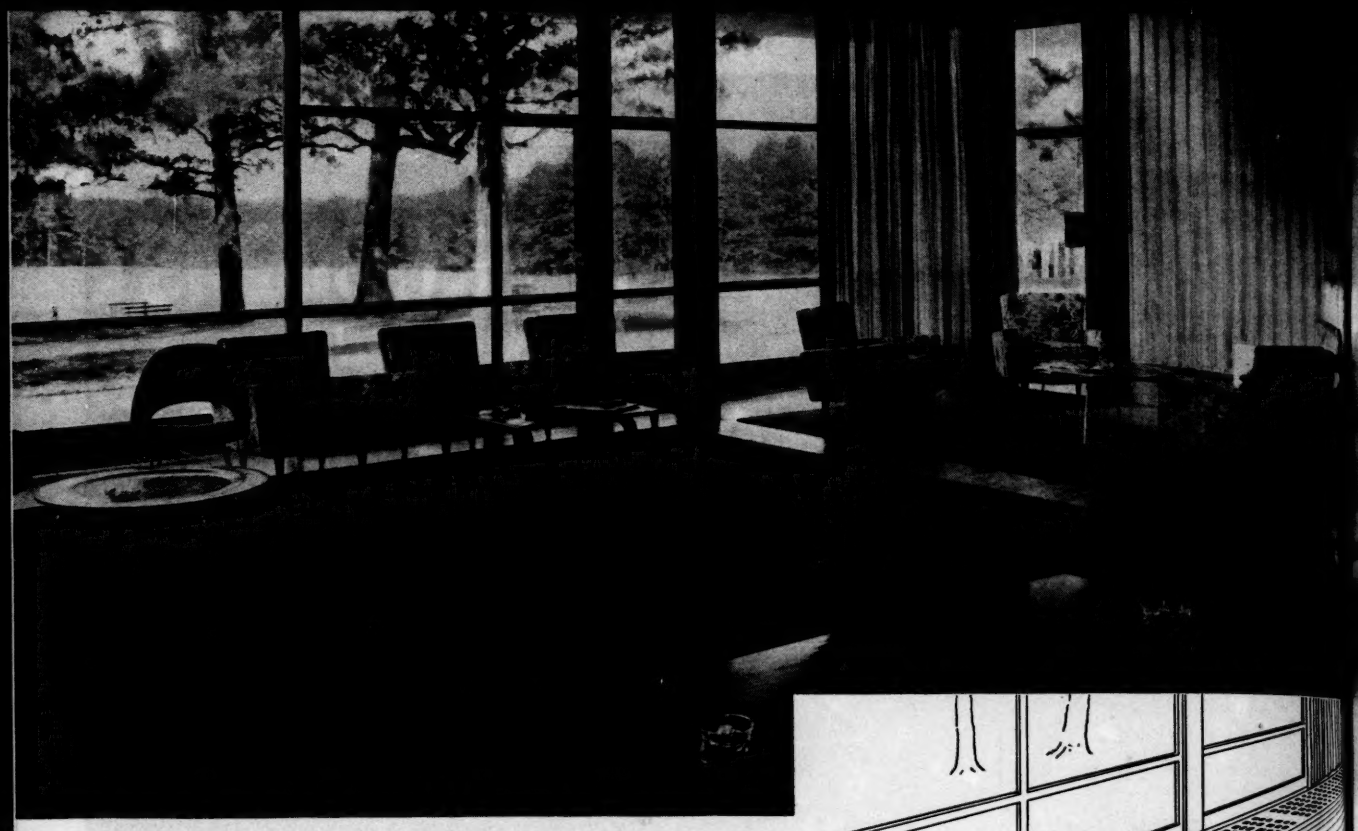
**DE BOTHEZAT FANS DIVISION**
American Machine and Metals, Inc. East Moline, Illinois



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When Architect William Henley Deitrick set out to design the new Carolina Country Club his aim was to provide complete flexibility to meet the requirements of approximately 600 members. In accomplishing his objective he provided for a terrace on three sides and for full length windows over practically the entire northern exposure.

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Are you planning a club or other difficult-to-heat building? Investigate Webster Tru-Perimeter Forced Hot Water Heating. For details write us or see your Webster representative. **Address Dept. HV-12**

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# WALVECTOR
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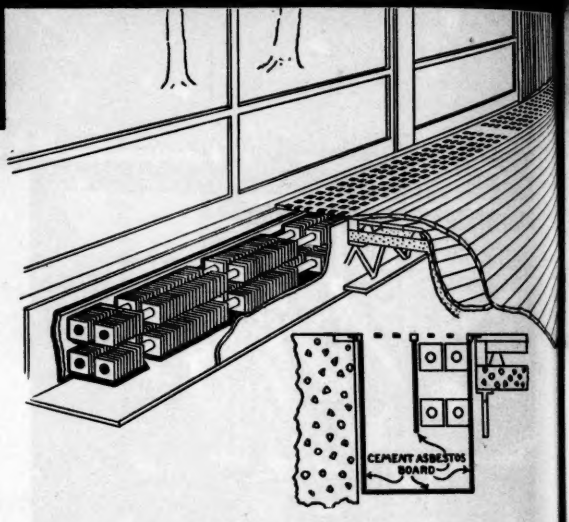
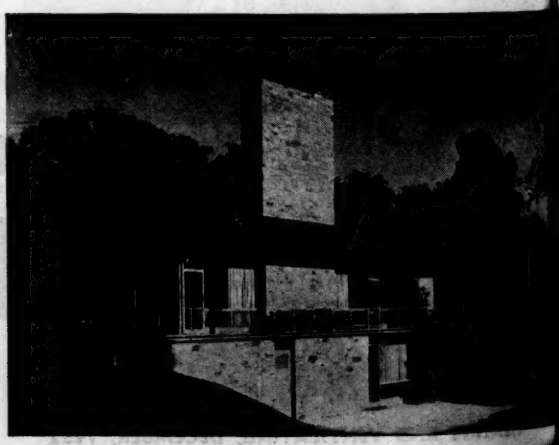
**For Steam or Hot Water Heating**




Sketch shows arrangement of Walvector below floor. Upp
view shows lounge with sliding doors and grilles over Walvect

Wm. Henley Deitrick, Inc., Architect; Ray V. Wasdell, Stru
tural Engineer; H. W. Moser, Mechanical Designer; Matth
and Stanislawa Nowicki, Interior Decoration; E. G. Thurlo
Landscape Architect; Strong & Harmon, General Contracto
Smith & Mills Plumbing & Heating Co., Heating Contracto



*Carolina Country Club, Raleigh*

# HEATING AND VENTILATING

A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH THE DESIGN AND APPLICATION OF AIR CONDITIONING, REFRIGERATION, PIPING, AIR SANITATION, HEATING AND VENTILATION IN BUILDINGS



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## THIS MONTH'S COVER

A 4 x 3-inch process pump installed in a chemical plant. This pump, rated at 220 gpm, 150 ft head, operating at 2,250 rpm, pumps 24 deg Baume starch. Photograph, courtesy of Allis-Chalmers Mfg. Co. See article on Selection of Centrifugal Pumps, page 85.

# Washington News

LORING F. OVERMAN

IN many ways, the ship of state appears to be drifting more or less aimlessly, waiting for the new pilot to take over the controls on January 20. No pun intended. Fact is, however, that "taking over the controls" is one of the topics for speculation.

Will priorities and allocations be eased or tightened?
Will wage, price and rent controls be extended?
Will tax measures now slated to expire be renewed?
Will the defense program be stepped up?

### Awaiting the Pilot

The indecision which is apparent on every side in Washington is certainly no surprise. With the advent of a new Administration only weeks away, members of the crew are more preoccupied with finding a life raft than with stoking fires. The situation demonstrates once again the wisdom of moving Inauguration Day forward from March 4, thus shortening the drifting period by two and one half months.

As for easing priorities and allocations provisions, everything will depend upon what President-elect Eisenhower recommends with regard to Korea and other military hot spots. There is little doubt but what he will be expected to clean up the mess in Korea as well as in Washington, so it can be assumed that he will not deemphasize military demands for some time to come.

After all, "Ike" was elected partly because the voters realize that most of our problems have a military origin, and that solving them involves an understanding of military procedures.

So expect military requirements to get the green light. On the other hand, with a Commander in Chief who knows the defense language so intimately, there should be fewer false starts, and consequently more value per defense dollar.

Similarly, the capacity to produce has been stepped up to such an extent that the next few months can be expected to see phenomenal quantities of defense material produced without greatly curtailing the civilian economy. This assumes the availability of raw materials, labor, and power.

### Economic Controls

Economic controls—the direct control of prices, wages and rents—appear certain to expire on April 30 as now provided in the Defense Production Act. On that assumption, the Office of Price Stabilization operates in what some observers call a "policy vacuum." Members of the staff appear as uncertain of the present as of the future.

For example, the present price director, Tighe Woods, is finding that his Washington staff does not share his enthusiasm for the idea of placing price controls in the hands of local boards. Woods points out that the local board system worked well when he was Director of Rent Stabilization. Opponents of the idea observe that controlling a single item like rents, is much simpler than trying to work out equitable prices for everything in the stock of a hardware or variety store, or the corner grocery and drug store. They contend that even under the present centralized system, many of the questions have to go all the way to top brass before being answered. With a local board setup, it is suspected that there would be as many versions of an OPS regulation as there are branch offices.

As a substitute for the Woods idea of local boards, some within OPS are proposing highly selective controls on such things as basic metals, heavy machinery, petroleum chemicals and other items somewhat directly related to the defense program.

If such a program, were adopted, proponents argue, the Administration would gain time in which to organize tax, fiscal and monetary policies in such a way as to provide the indirect controls preferred by many in the Republican party. Chief obstacle to such a controls program is that it would require control of wages in the fields affected. The Defense Production Act specifically provides that the President may not invoke general price controls without also establishing wage controls. But organized labor is unalterably opposed to wage controls, so it seems unlikely that any half-system of pricing will be worked out.

### About Taxes

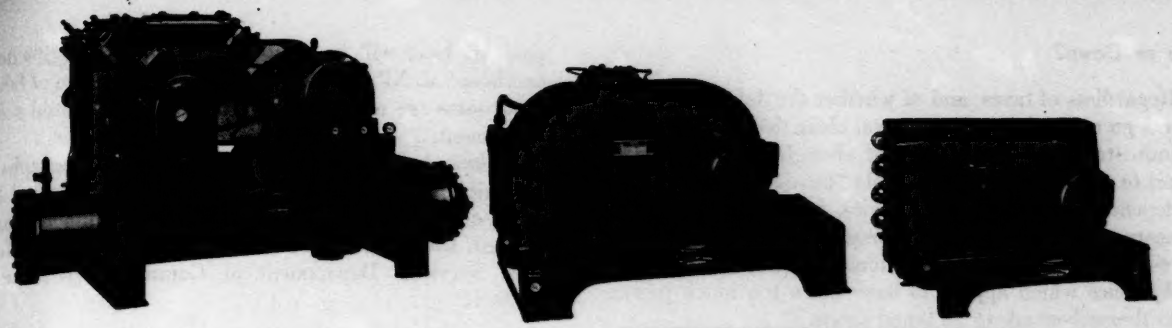
The question of whether taxes can be reduced quickly appears to revolve around the question, can the new Administration afford to run the risk of dropping some $8.5 billion in revenues? It has been estimated that tax revenues would drop by that amount a year if reduction included in the present law go into effect. The Joint Committee on the Economic Report gives the following breakdown of the reductions: excess profits tax, revenue losses, $2.5 billion; reduced corporation taxes, $2.0 billion; lower individual income tax, $3.0 billion, and reduced excise taxes, $1.0 billion.

If revenue losses of $8.5 billion annually should materialize, some observers predict a deficit of $13 billion for 1954, and $14.7 billion for 1955.

Deficits of such size would not be helpful to the new Administration so a two-phase attack is planned. Such economies as are possible will be introduced, but tax cuts may also have to be tempered.

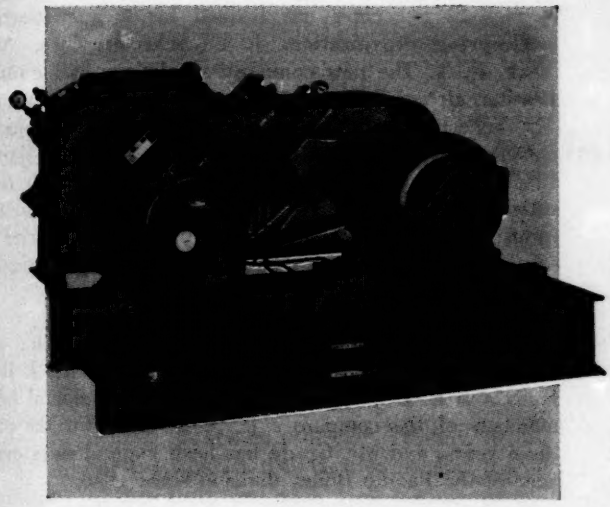
The present law, unless amended, will reduce the excess profit tax to 15% on 1953 calendar year excess profits, and eliminate the tax in subsequent years. The law will also reduce the tax on 1954 individual income by approximately 10%. It seems almost certain that the excess profits tax will be allowed to expire but revenue hunters may trim the reduction for individuals to 5%. They have even toyed with the idea of a federal sales tax, but concede that it would be too unpopular as an introduction to Republican "economies."

The real fact is that the new President faces a most difficult budget problem. Having promised tax reduction and government economies, he finds himself committed by predecessors to expenditures difficult to trim. Consequently, tax savings may have to be deferred "due to circumstances beyond GOP control."



# FOR REFRIGERATION UNITS FOR ANY NEED

## HIGH, MEDIUM, LOW OR SUB ZERO TEMPERATURES YOU CAN'T BEAT



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**January 26-30**
**BRUNNER BOOTHS 2-209, 213, 215**

### Up or Down?

Regardless of taxes, and of whether the defense requirements go up or down, it is crystal clear that the incoming Administration will do a lot of changing around in an effort to provide a more favorable "business atmosphere." Independent Washington agencies, in addition to those concerned principally with defense matters, are due for a re-examination by Congressional committees.

Agencies which appear to have taken too much power unto themselves are to be toned down.

In the meantime it would be extremely hazardous for any business to jump the gun on wage, price, or materials controls. With nothing to lose, the agencies are on the lookout for violations which might serve as "examples."

One such incident, involving five firms said to have diverted steel acquired on rated orders, resulted in suspension of all priorities assistance for the duration of the Defense Production Act.

Another charge resulted in the first criminal conviction for violating NPA regulations. It involved a Texas manufacturer of industrial fans, blowers and other ventilating equipment. The violation charged was the diversion of 145 tons of rolled sheet steel.

Commented NPA enforcement officials—

"Only by continuous and vigorous enforcement action can we protect the law abiding consumers of controlled materials from depredations of those who attempt to cash in on shortages, created by the national emergency."

As in all legal actions the defense agencies make scant allowance for unfamiliarity with the regulations. They take the position that all persons subject to wage or price regulations, or materials controls, must observe all necessary precautions to assure compliance.

### Washington Miscellany

*Construction Ban.* Earlier-than-planned easing of the construction ban has been recommended by the Construction Industry Advisory Committee. Regulations had been scheduled to be relaxed on May 1, 1953. Because of an easing of the steel situation, the IAC has urged that the date be stepped up to January 1.

The proposed relaxation would permit self-authorization of controlled materials for recreational, entertainment and amusement construction; multi-unit walk-up residences; multi-unit residences with elevators, and one-through-four-family houses. More liberal self-authorization would also be approved for the "all other" construction group, including industrial, commercial, public, hospital, university, school, public utility, water and sewage projects, transportation, and highways.

*Atomic Power.* The race to develop atomic power continues. Eleven companies are to join with Dow Chemical Co. and the Detroit Edison in a Joint study with Atomic Energy Commission for the development of a Nuclear reactor to produce power. The companies are all public utility concerns.

*Plumbing Brass Shines.* The Industry Advisory Committee of the Plumbing Brass Goods Manufacturers' Industry has told NPA that production equal to that of 1952 can be continued in 1953. The prediction assumed continuation of the present copper supply. NPA warned that there is little possibility of increasing supplies of nickel for civilian products. NPA estimates of demand for plumbing equipment in 1953 will be high in fields of housing, schools, and hospital. NPA also reported that an increase of 80,000 classrooms are needed merely to handle increased school enrollment.

*Technical Research Pamphlets.* The Bibliography of Technical Reports, issued by the Office of Technical Services, contains 324 subjects of interest to the Research-minded. Copies may be secured from the Office of Technical Services, Department of Commerce, Washington 25, D. C.

# NEWS BRIEFS

• Jack E. Schechter has formed his own contracting engineering organization, J. E. Schecter Corp., New York, N. Y. The new company specializes in industrial heating, air conditioning, refrigeration and power plants. Mr. Schechter, who is chief engineer of the company, was formerly chief engineer with the James H. Martin Co., New York. Mr. Schechter has been doing air conditioning engineering for 22 years, particularly in the industrial and large commercial type buildings. Prior to joining the Martin organization, he was with Frigidaire Division of General Motors.

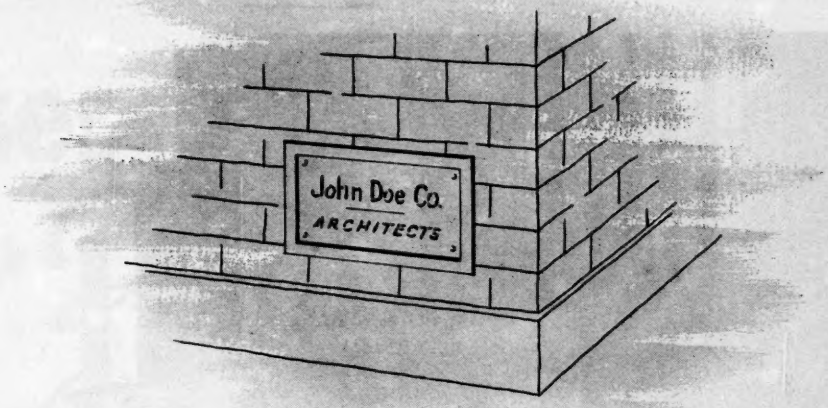
• United States Radiator Corp., Detroit, Mich., announced the election of two new vice-presidents, J. Roy Knox and E. J. Grady. Mr. Knox has been general sales manager of the company's U. S. division for the past three years, and Mr. Grady has been general sales manager of the Pacific Boiler division since 1946.

• C. D. Bradrick has been appointed manager of manufacturing of General Electric Company's Heat Pump Dept., Bloomfield, N. J. Mr. Bradrick was formerly manager of industrial engineering for manufacturing in the air conditioning division, and prior to joining the company in 1950, he was plant manager of Sanitary Refrigeration Co., Fond-du-Lac, Wis.

• T. L. Smith, formerly Chicago district sales manager, has been appointed sales manager of Residential Air Diffuser Div., W. B. Connor Engineering Corp., Danbury, Conn.

• American Blower Corp., Detroit, Mich., announced the appointment of E. W. Petersen as general sales manager. Mr. Petersen joined the company in 1923. He became merchandise manager for the packaged products of the corporation's heating and ventilating divisions in 1932, and was elevated to assistant general sales manager in 1951. His new duties will cover all divisions of the corporation.

• M. J. Hackney has been appointed supervisor of sales training of General Electric Company's Air Conditioning Div., Bloomfield, N. J. Mr. Hackney was formerly with sales of air conditioning equipment and refrigeration machines. Prior to joining the company he was assistant sales manager of York Distributors, Inc., Long Island City, N. Y.




# *Is Destructive Condensation Jeopardizing Your Reputation?*

SPECIFYING on a "take-it-for-granted" basis, some architects and builders, with their own hands, sow the seeds of destruction inside the walls of buildings they are so proud of.

A sturdy, frame house in Pennsylvania, for example, had to be moved. But it was found that the sills had rotted away. Ordinary insulation inside the walls, with asphalt rather than metallic vapor barriers, had promoted destructive condensation, causing rot and decay.

A large brick and steel apartment development in the suburbs; a huge housing project in a big city; each caused great expense to its sponsors when ordinary insulation inside walls produced condensation, causing peeling paint and crumbling plaster.

Protection of buildings as well as reputations is ensured by the use of non-condensation-forming, zero permeability, waterproof multiple accordion aluminum sheets, which are an exceptional barrier to heat flow.

Pre-fabricated forms of multiple accordion aluminum sheets are now available which automatically create four or six reflective air spaces.

The air spaces eliminate nearly all heat flow by CONDUCTION. The aluminum surfaces throw back 95% to 97% of heat flow by RADIATION. CONVECTION is blocked.

Further information may be found in standard reference manuals or in "Simplified Physics of Vapor and Thermal Insulation" by Alexander Schwartz. Copies may be obtained *free* by mailing the coupon below.

The commercial form of pre-fabricated multiple accordion aluminum insulation is Infra Type 6, 4, and 4 Jr.

**THERMAL FACTORS, TYPE 6 INFRA**

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| **Up-Heat** | **C.089, R11.23 equals 4⅜"** | **DRY Rockwool** |
| **Wall-Heat** | **C.073, R13.69 equals 5⅜"** | **DRY Rockwool** |
| **Down Heat** | **C.044, R22.72 equals 9"** | **DRY Rockwool** |

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# Dun & Bradstreet

*All photos, courtesy Kerby Saunders, Inc.*

Above, Dun & Bradstreet Building, New York City. Reinhard, Hofmeister & Walquist, Archts.; Syska & Hennessy, Inc., Consulting Engineers; George A. Fuller Co., Gen. Contractor; Kerby Saunders, Inc., Air Conditioning Contractors.

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## -in unusual high-pressure small-duct ventilation systems

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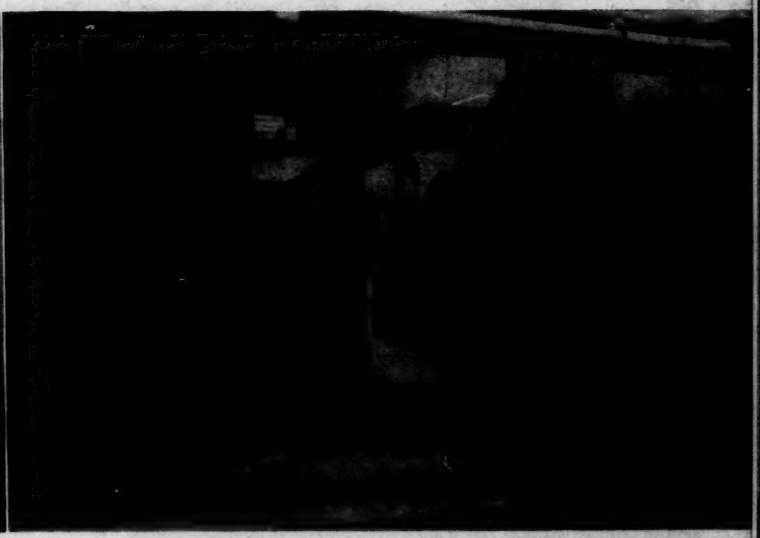
What is *your* job for air? "Buffalo", with its complete line of proven air handling units and its 75 years of experience in air, is ready to help you get the best possible results, as it has helped Dun & Bradstreet and many other well-known firms.

*"Almost from the first, the equipment and system worked exactly as they were intended to..." from OFFICIAL BULLETIN, Heating, Piping and Air Conditioning Contractors National Association.* Below are shown "Buffalo" high pressure fans on the 12th floor.



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## If you are not using FAR-AIR* filters – you may be paying 33⅓% too much for air filtration!

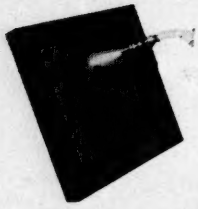
**HERE'S WHY...**

FAR-AIR filters with their many exclusive design features are the first and original high velocity air filters. Each unit is engineered to hold *more* dirt, handle *more* air with *less* pressure loss and give *greater* efficiency than other impingement filters. This means that your maintenance and installation costs are drastically reduced—so much so, that it probably will pay you to replace your present filters with FAR-AIR.

**1/3 SPACE SAVING**

Because these filters handle 50% more air per unit with less pressure loss, two FAR-AIR filters will do the work of three ordinary types. You make substantial savings in first cost through smaller plenum chambers and fewer filters and holding frames.

**CUT MAINTENANCE UP TO 60%**



FAR-AIR filters hold more dirt per unit without decreased efficiency, so maintenance is cut approximately ½. Also, due to the media design, they can be cleaned by simply flushing with a hose.

*These filters can even be cleaned and reoiled without removing them from the filter bank!* All these points add up to less maintenance time and cost than you would believe possible.

**"LIFETIME ENGINEERING" SAVES YOU MONEY**

Extra quality in construction allows these filters to far outlast ordinary types. Sixteen gage steel filter and holding frames assure well-aligned, rigid filter banks. Reinforcing rods drilled through the media make distortion virtually impossible. Felt linings prevent air bypass. Firmly packed media provides even density and assures uniform high efficiency over the entire filter area.

**EXCLUSIVE PROGRESSIVE LOADING FEATURE GIVES YOU MORE EFFICIENT FILTERING**

The famous herringbone-crimp design of the media allows the filter to load with dirt progressively through the entire filter, not just on the face. There is exceptionally low pressure loss even on a fully loaded filter because channels in the media allow passage of air. You get more efficient filtering over a longer period of time as a result.

**OTHER FAR-AIR PRODUCTS INCLUDE:**

SELF-WASHING FILTERS
KITCHEN GREASE ELIMINATORS
ENGINE AND COMPRESSOR FILTERS
ROTARY (EVAPORATIVE) COOLERS
AIR BAFFLE EQUIPMENT
FILTER SERVICING EQUIPMENT

**Check the many money-saving features of FAR-AIR filters...**

**Mail the coupon, today!**

*Trade Mark

**FAR-AIR FILTERS**

*"Better by Farr"*

**FARR COMPANY**

*Manufacturing Engineers*

Los Angeles • Chicago • New York

**You're Invited! Chicago Exposition—Booth 907**

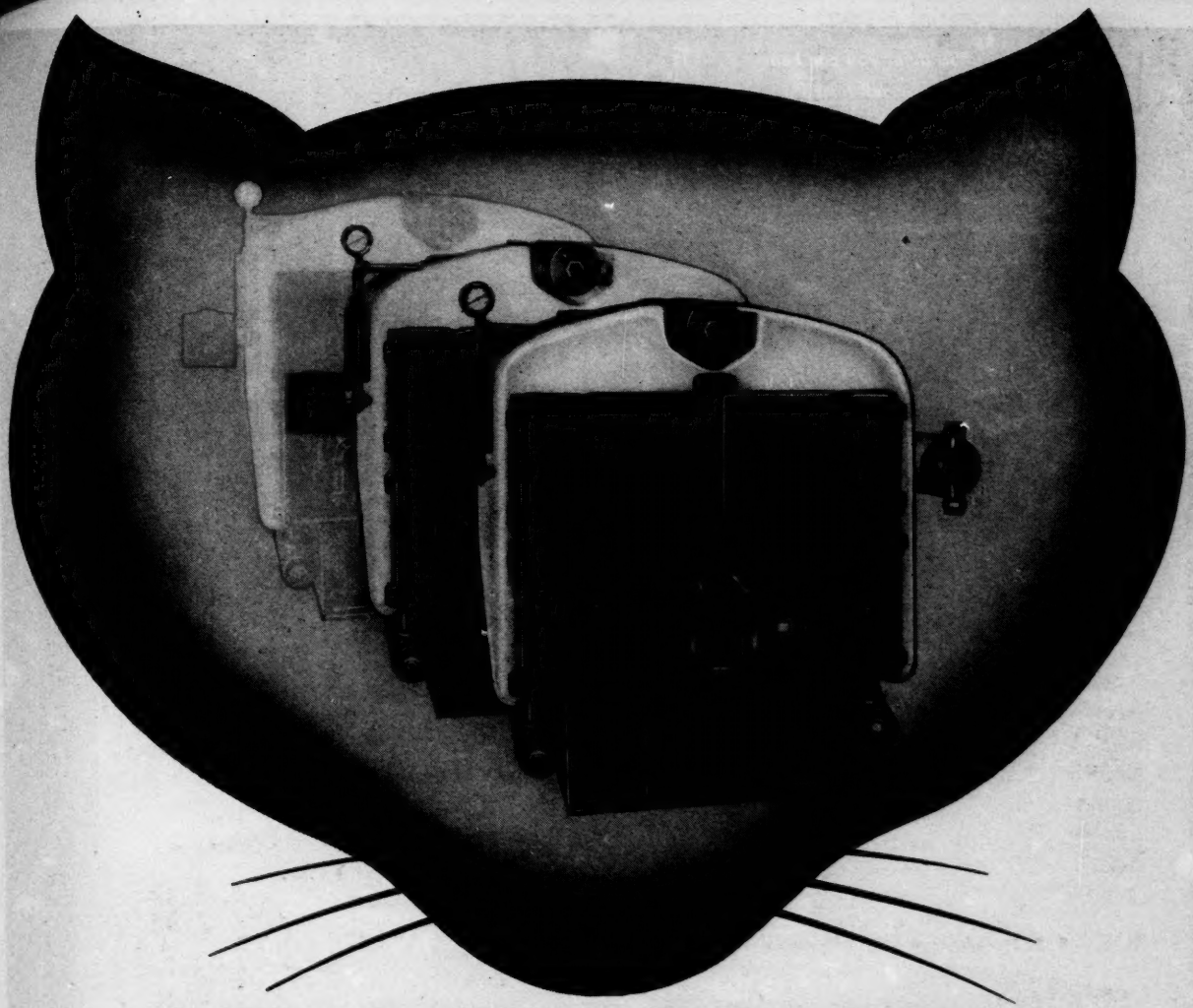
FARR COMPANY, P. O. Box 10187 Airport Station
Los Angeles 45, Calif.

Gentlemen: Please send me complete information on FAR-AIR filters. I ☐ would ☐ would not like a Farr Field Engineer to assist me with my filter problems.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____



## when buying a boiler today

# would you settle for 3 lives?

If history means anything, the H. B. Smith Boiler you install today will be on the job when the year 2000 is born! That's because H. B. Smith Boilers are made of cast iron — universally acknowledged to have the longest life in boiler service. Furthermore, H. B. Smith Boilers are made of the *highest quality* cast iron, with self-cleaning vertical water tube construction that promotes top efficiency with least maintenance.

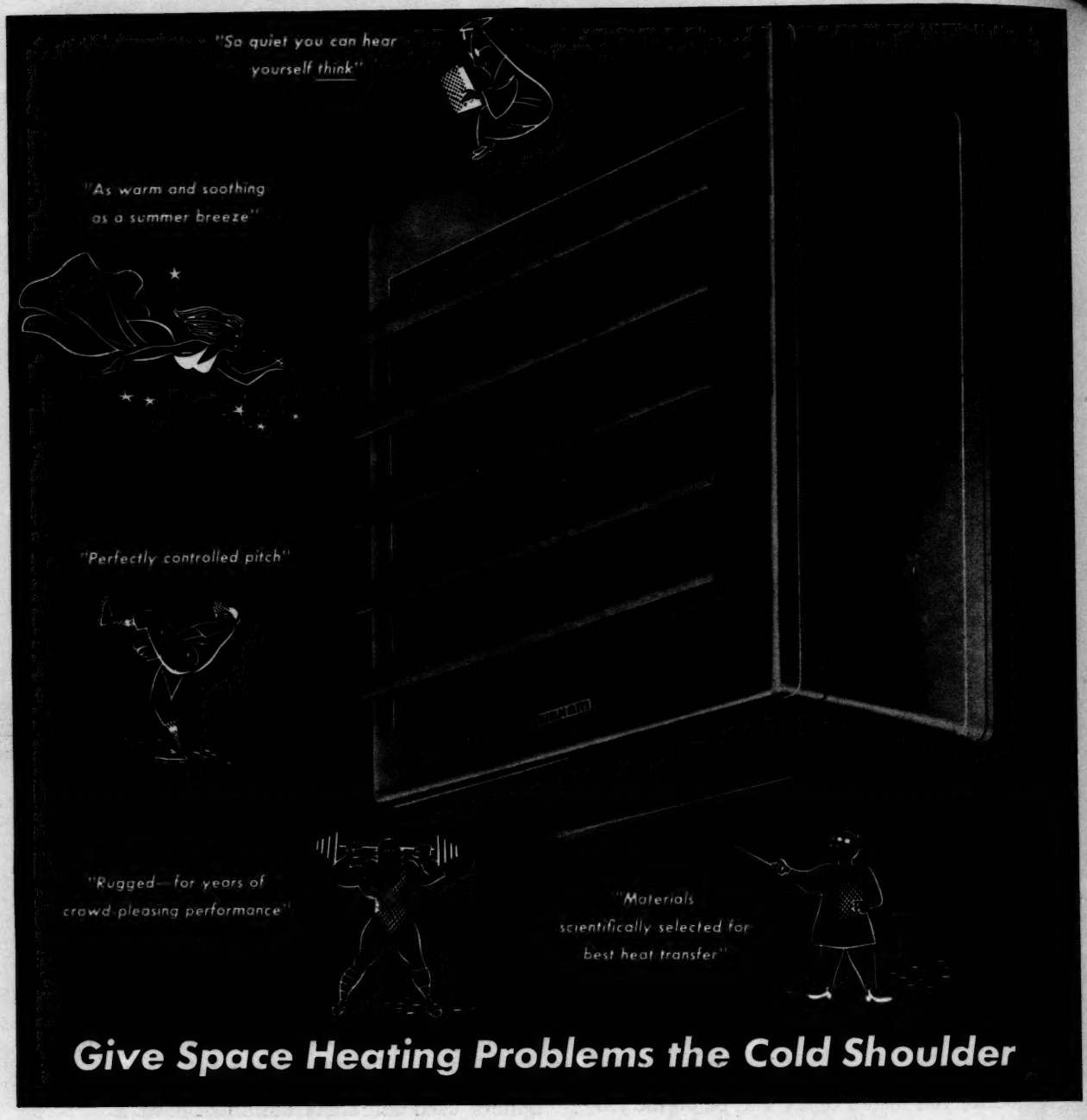
It's no secret that most conventional boilers used in larger buildings have a life expectancy of about 20 years. Whereas thousands of H. B. Smith Cast Iron Boilers have been in constant service for 40, 50 — yes, even for 60 years, without ever a major repair.

Settle on an H. B. Smith Cast Iron Boiler today, and you're all *settled* for tomorrow.

H. B. Smith **CAST IRON BOILERS**

*A CENTURY IN '53*

**The H. B. Smith Company, Inc., Westfield, Massachusetts**


"So quiet you can hear yourself think"
"As warm and soothing as a summer breeze"
"Perfectly controlled pitch"
"Rugged—for years of crowd-pleasing performance"
"Materials scientifically selected for best heat transfer"
Give Space Heating Problems the Cold Shoulder

You can ignore almost any space heating problem with the proper capacity Dunham Unit Heater on the job. It's a good way to get the exact amount of heat . . . when, where and how you need it.

Dunham Heaters have a "plus value" in quality construction, too—a rugged *cast bronze header* is standard equipment! It's non-corrosive which means extra years of top-notch performance.

Dunham Heaters are as quiet as they are comfortable. Fans turn at relatively slow speeds, driven by rubber mounted motors. Louvers don't loosen, rattle or bang. With Dunham Heaters you hear little; feel just right. Write today for further facts.

***Send for Free Bulletin***

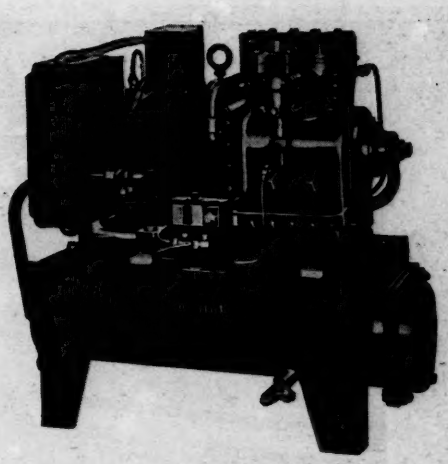
Bulletin 1301-16 tells how sturdy, longer lasting Dunham Unit Heaters can solve your space heating headaches. Full data on sizes, construction, capacities. Your free copy is waiting now at: C. A. Dunham Company, 400 W. Madison Street, Chicago 6, Illinois.

**DUNHAM UNIT HEATERS**

**ANOTHER QUALITY PRODUCT OF C. A. DUNHAM COMPANY—CHICAGO • TORONTO • LONDON**

# COPELAMETIC

THE *Accessible* HERMETIC



## fits into any air conditioning plan

Cutaway of 7½ H.P. COPELAMETIC Motor-compressor

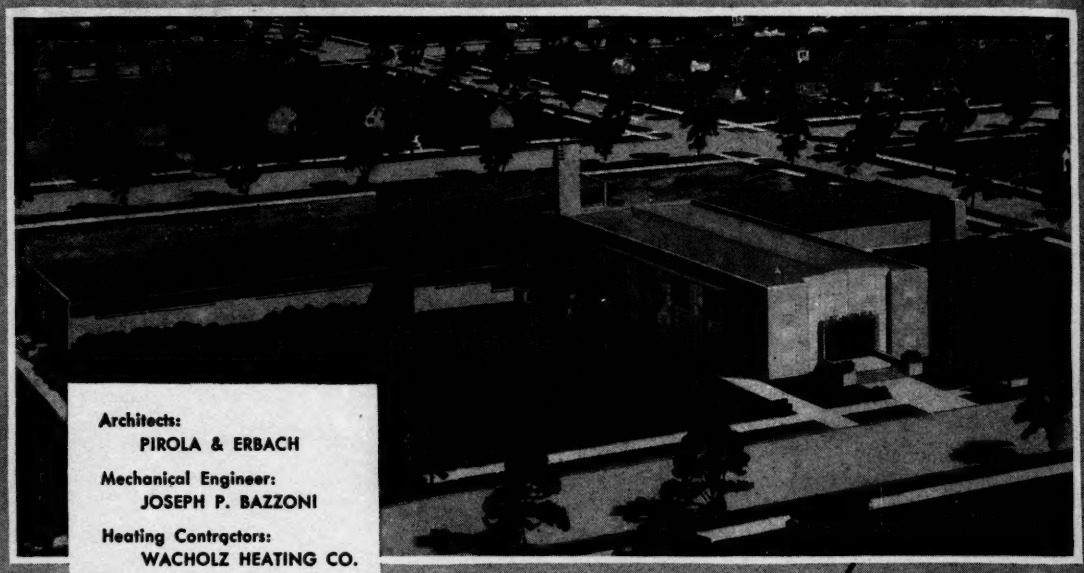
Whether it's a room air conditioner, a large package unit or a huge factory system, COPELAMETIC is your answer to the question "Which refrigeration unit shall I recommend for the air conditioning system?" COPELAMETIC has become the standard of comparison for dependability, ruggedness, compactness and long life. Your clients will appreciate the COPELAMETIC design which eliminates belts, seals and manual oiling . . . reasons for 9 out of 10 service calls. Better yet, they'll appreciate the practical feature of accessibility.

Air-cooled, remote COPELAMETICS are built from ¼ thru 3 HP. There are also water-cooled, remote units from ⅓ thru 7½ HP. Self-contained COPELAMETICS are available for all applications. Write for Condensed Catalog C-52.

REFRIGERATION UNITS
(OPEN TYPE AND COPELAMETIC)
WATER COOLERS

**Copeland**
DEPENDABLE *Electric* REFRIGERATION

**COPELAND REFRIGERATION CORPORATION, SIDNEY, OHIO**



Architects:
PIROLA & ERBACH
Mechanical Engineer:
JOSEPH P. BAZZONI
Heating Contractors:
WACHOLZ HEATING CO.

# St. Monica Parish

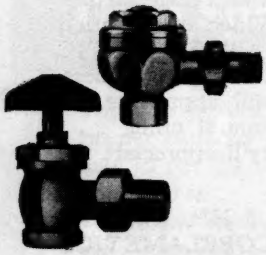
## *Marsh equipped*

Reproduced above is an architectural rendering of St. Monica Parish which combines a stately church and modern school now nearing completion in Chicago.

Marsh Valves and Traps were specified for the well-designed heating system — a logical choice for a building executed in the tradition in which no effort is spared that can contribute to permanence.

The selection of Marsh equipment for St. Monica Parish is one more example of the preference accorded Marsh heating specialties for important buildings everywhere.

Ask for catalog 76-H covering all Marsh heating specialties.



Marsh Packless Radiator Valves and Marsh Thermostatic Radiator Traps were used throughout the St. Monica heating system.

The Marsh No. 12 float and thermostatic trap is typical of many Marsh traps used in the St. Monica installation.

**MARSH HEATING EQUIPMENT CO.** *Sales affiliate of Jas. P. Marsh Corporation*

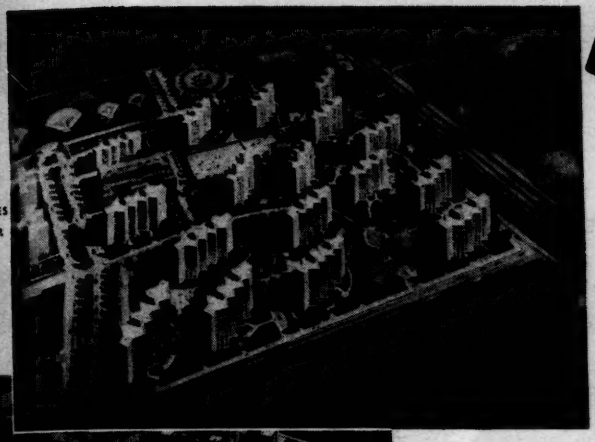
**Dept. U., Skokie, Ill.**

# MARSH

*Heating Specialties Since 1865*

**GAUGES • THERMOMETERS • WATER REGULATING VALVES • SOLENOID VALVES**

# ITZGIBBONS *heats more housing projects*



Here are just a few recent larger New York City Housing Authority projects to be heated with Fitzgibbons Steel Boilers. Thousands of similar installations throughout the nation have proven that outstanding performance and fuel economy go hand-in-hand. Good boiler design means trouble-free heating service. Be assured of these vital factors in your next heating job by specifying the Fitzgibbons Boiler.

MOST ECONOMICAL IN FUEL — 1885 — THE FITZGIBBONS BOILER

SINCE 1886

**Fitzgibbons Boiler Company, Inc.**

101 PARK AVENUE, NEW YORK 17, N. Y.

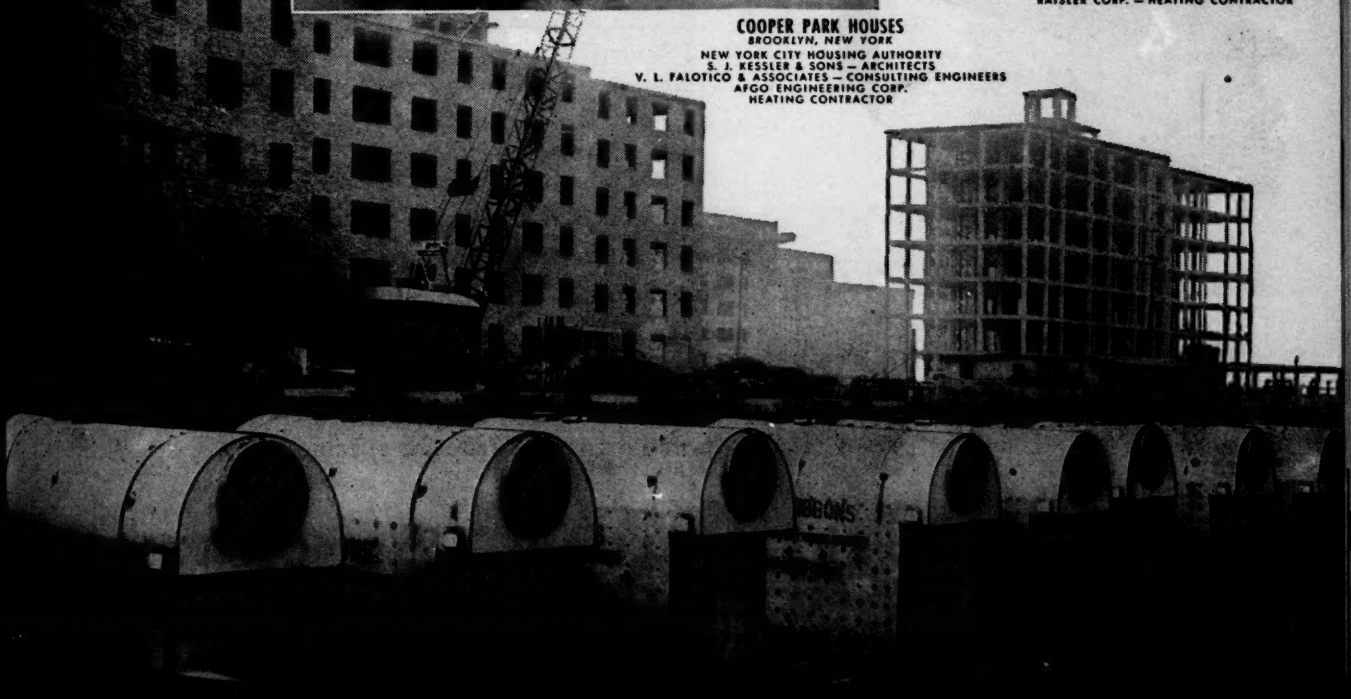
*Manufactured at:* OSWEGO, N. Y. *Sales Branches in Principal Cities*

SBI

**GEORGE WASHINGTON HOUSES**
NEW YORK, N. Y.
NEW YORK CITY HOUSING AUTHORITY
ALFRED HOPKINS & ASSOCIATES
ARCHITECTS
GUY L. PANERO — CONSULTING ENGINEER
J. L. MURPHY, INC. — HEATING CONTRACTOR

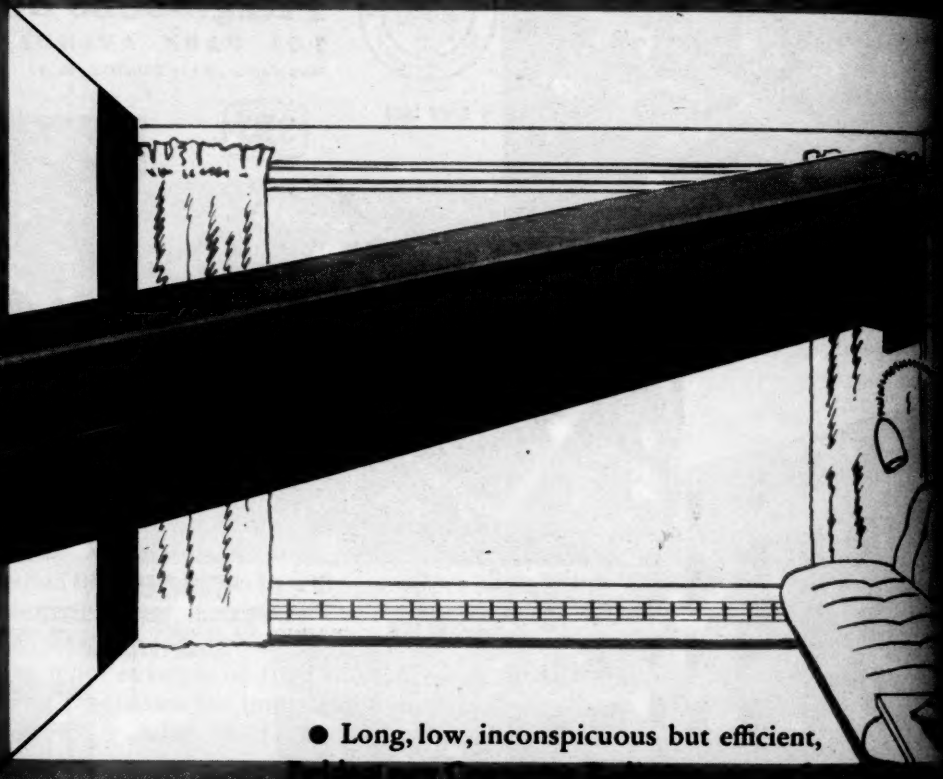
**VAN DYKE HOUSES**
BROOKLYN, NEW YORK
NEW YORK CITY HOUSING AUTHORITY
KELLY AND GRUZEN — ARCHITECTS — ENGINEERS
EDWARD E. ASHLEY — CONSULTING ENGINEER
RAISLER CORP. — HEATING CONTRACTOR

**COOPER PARK HOUSES**
BROOKLYN, NEW YORK
NEW YORK CITY HOUSING AUTHORITY
S. J. KESSLER & SONS — ARCHITECTS
V. L. FALOTICO & ASSOCIATES — CONSULTING ENGINEERS
AFGO ENGINEERING CORP.
HEATING CONTRACTOR



# Problem:

# Solution:



● Long, low, inconspicuous but efficient,

# CTURE WINDOW ?

## ATOR

## INDOWS

dders Convector-Radiators for picture windows
are made for free standing, semi-recessed
and fully recessed installations.
Sketches at right show how.
They simplify planning and installation
for architects, engineers, interior decorators
and contractors.
No interference with draperies,
niture arrangement or wall-to-wall carpeting.
Write for Catalog CRG-C1.

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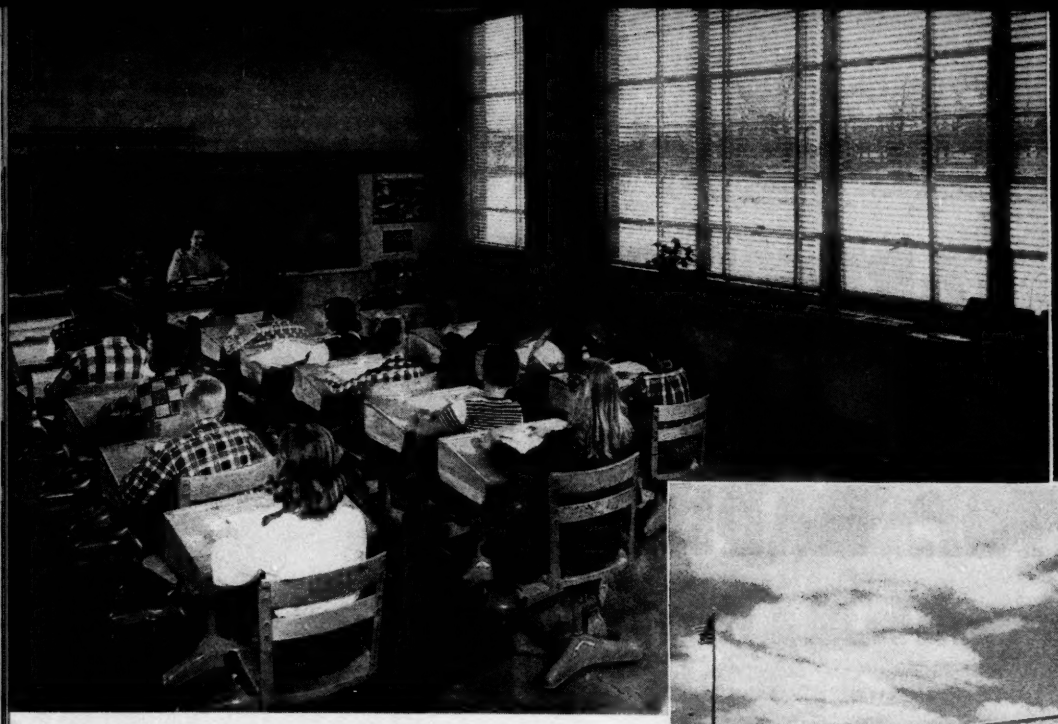
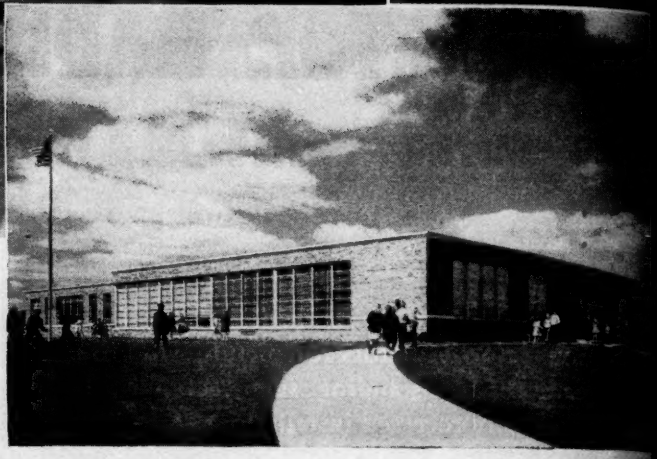


Lincoln Elementary School and Classroom, Mt. Prospect, Ill.
Architects & Engineers:
Childs & Smith and T. Maseng & Associates
Contractor: Plonsker Engineering Co.



## Some of the Many Installations of

# POWERS *Pneumatic Systems of* Temperature Control

## In Contemporary Elementary Schools

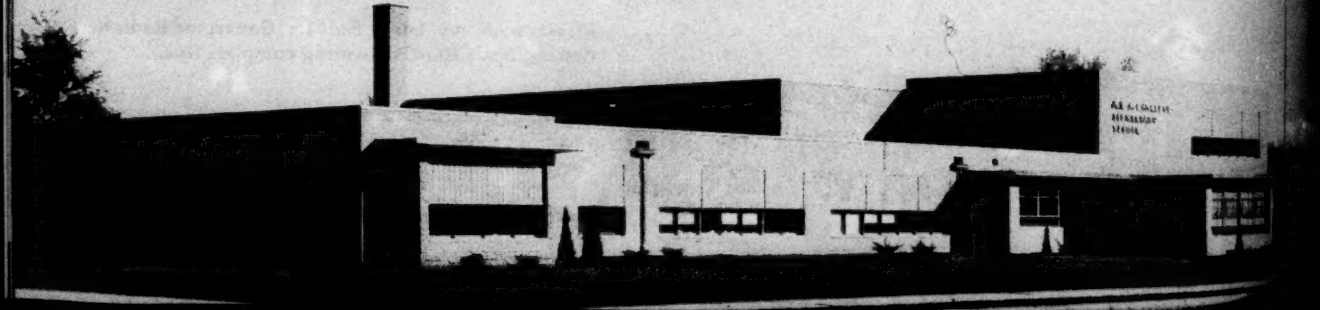
These five new modern schools and thousands of others represent one of our nation's most valuable assets. Present and future returns on this investment are incalculable.

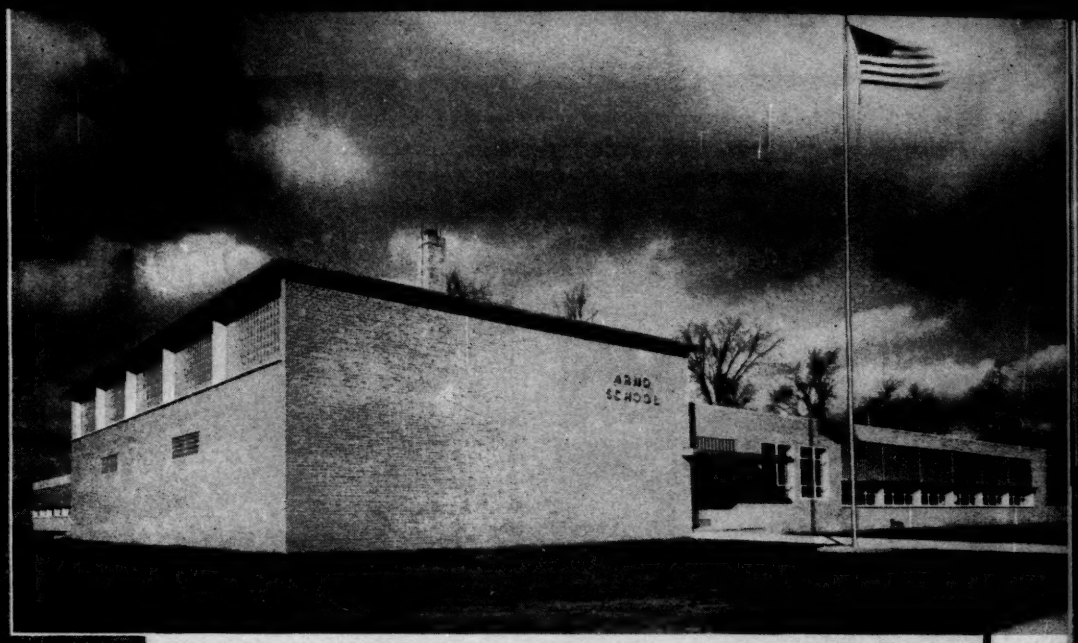
Maximum returns on the investment in automatic temperature control have been assured by the selection of Powers equipment. Regardless of outside weather, classrooms are held at comfortable temperatures automatically. Teachers and pupils are more efficient in rooms that are not OVER-heated. Also, important fuel savings will pay sizeable dividends year after year.

When you want a temperature control system that usually gives over 25 years of reliable-low-maintenance-cost service consult Powers nearest office. There's no obligation.

**Established in 1891 • THE POWERS REGULATOR COMPANY • SKOKIE, ILL. • Offices in Over 50 Cities**

McCandless Elementary School, Hutchinson, Kansas
Architect: McCrackin & Hiett
Engineers: Horwath, Scott & Kinney
Contractor: Stevens, Inc.






POWERS

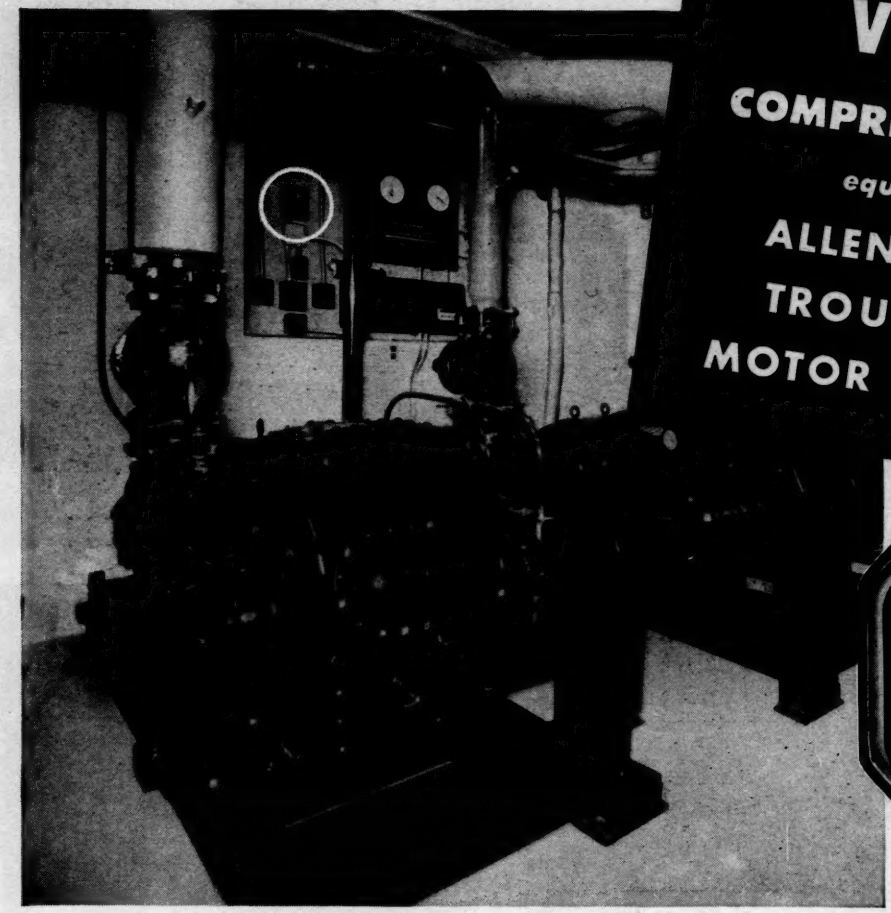
**Above: Arno Elementary School, Allen Park (Detroit), Mich.**
Architects & Engineers: Eberly M. Smith & Associates, Inc.
Contractor: Page Plumbing & Heating Co.

**St. Therese of the Child Jesus Parochial School, Philadelphia, Pa.**
Architect: James A. Nolen, Jr., Herbert H. Swinburne, Associate
Engineer: A. Ernest D'Ambly • Contractor: Charles J. Williams

POWERS

**North Street Elementary School, Rittman, Ohio**
Architect: Spahn & Barnes • Engineer: Vincent Eaton
Contractor: Kraus Plumbing & Heating Co.

Two Vilter VMC Freon Compressors, installed in a Kansas City bank, equipped with Allen-Bradley trouble free Solenoid Starters.



# VILTER COMPRESSOR UNITS

*equipped with*

## ALLEN-BRADLEY TROUBLE FREE MOTOR CONTROLS

A-B Quality

Why are Allen-Bradley automatic starters so popular for refrigeration and air-conditioning service? . . . Because they are trouble free. Only ONE moving part. No pivots, pins, or bearings to corrode or stick . . . no jumpers to break. You install them . . . and forget them!

No contact maintenance . . . Allen-Bradley cadmium silver alloy contacts never need cleaning, filing, or dressing.

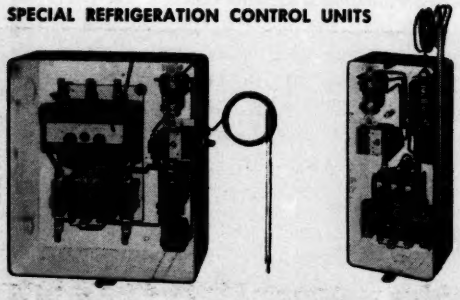
Dependable overload relays . . . Allen-Bradley thermal relays are accurate and always dependable . . . even after long service.

The Allen-Bradley trademark stands for millions of trouble free operations.

Allen-Bradley Co., 1330 S. Second St., Milwaukee 4, Wis.

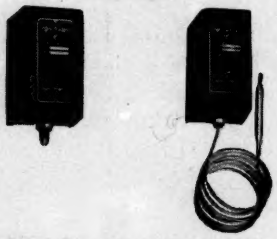
## Typical Refrigeration Controls

SPECIAL REFRIGERATION CONTROL UNITS



The two units above show Allen-Bradley special refrigeration control units consisting of Solenoid Starter, High Pressure Cutout, Thermostat, and Manual Starting Switch. Size 2 Unit at left, Size 1 Unit at right.

PRESSURE AND TEMPERATURE CONTROLS

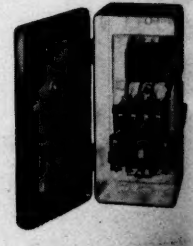


A-B Bulletin 836 Pressure Control and A-B Bulletin 837 Temperature Control. Accurate, rugged, compact units.

AUTOMATIC STARTER

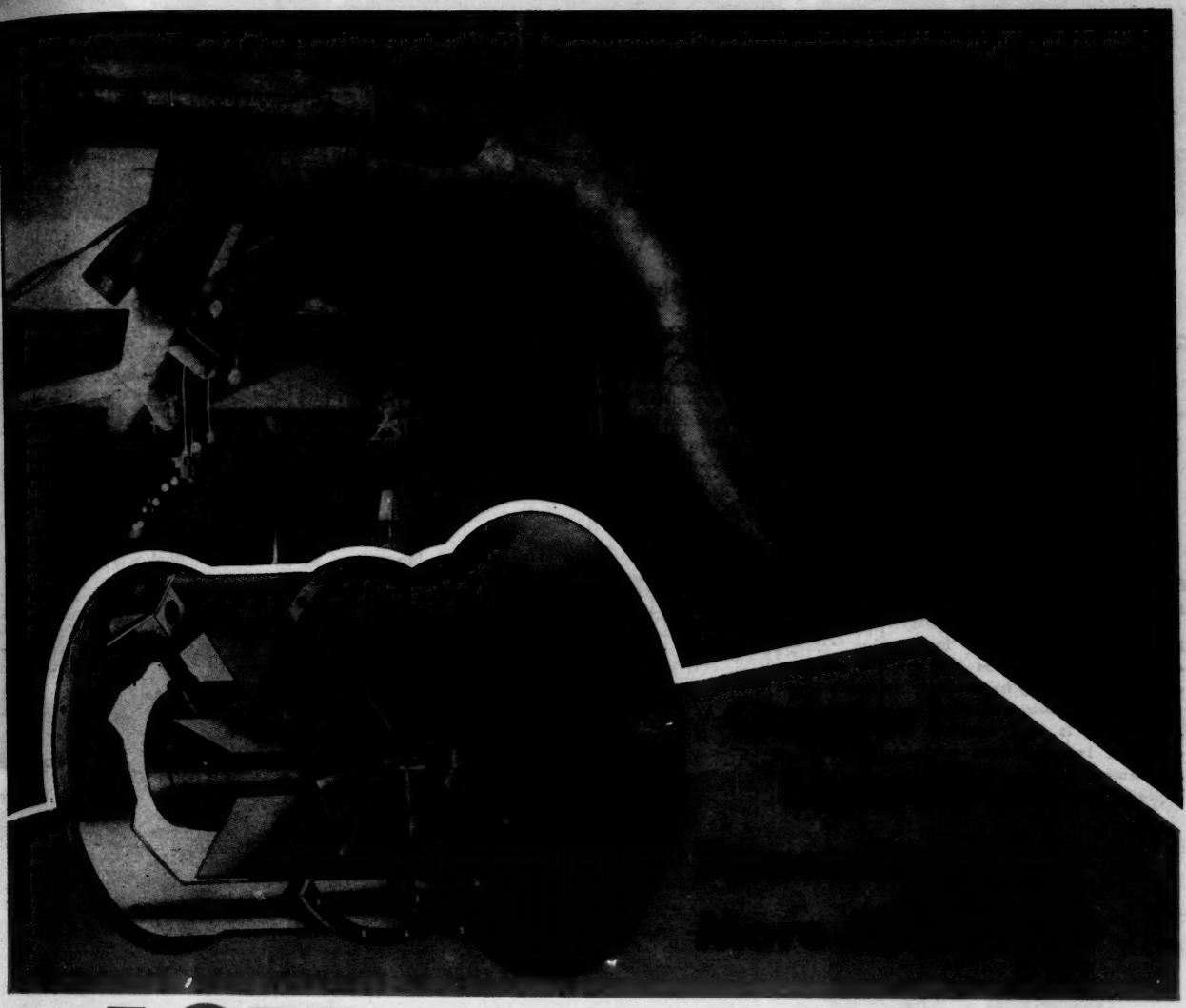
A-B Bulletin 709 Solenoid Starter. Note white interior.

COMBINATION STARTER



A-B Bulletin 712 [illegible] connect switch type combination starter. Saves installation [illegible]

# ALLEN-BRADLEY SOLENOID MOTOR CONTROLS



# JOY AXIVANE* FANS

## (SERIES 1000)

Write for Bulletin, or

*Consult a Joy Engineer*

The quieter operation, lighter, more compact design, lower power consumption and unmatched efficiency of JOY Axivane Fans are *real* advantages! What's more, their vaneaxial design and in-line construction permit mounting right in the air duct, making installation simple and saving greatly on time and cost. These features, plus the extreme flexibility of operating range made possible by adjustable blades—a standard feature of all JOY Fans—mean better, more dependable and lower-cost ventilation, no matter what your conditions are.

● Let JOY Axivane Fan specialists work with you for best results on your ventilation jobs.

*Reg. U. S. Pat. Off.

WAD 12C85

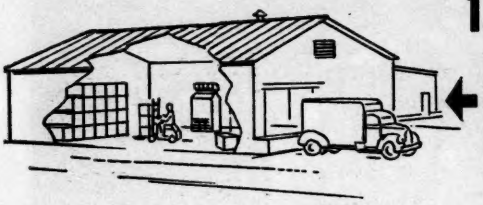
## JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED

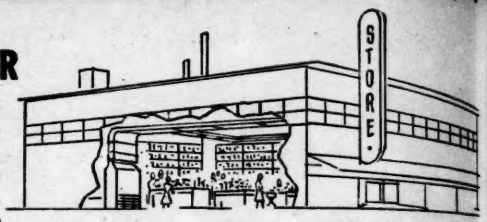
# DRAVO Counterflo

## A POSITIVE SOLUTION FOR



### 1. INDUSTRIAL CENTER

Where space is limited or roof heat losses are unusually high, Dravo Heaters require minimum space . . . no expensive boiler plant; roof heat losses low due to controlled recirculation of air; can be used with or without ducts.

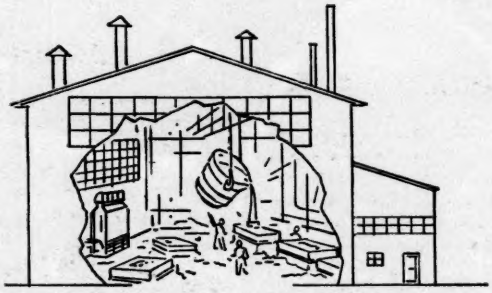


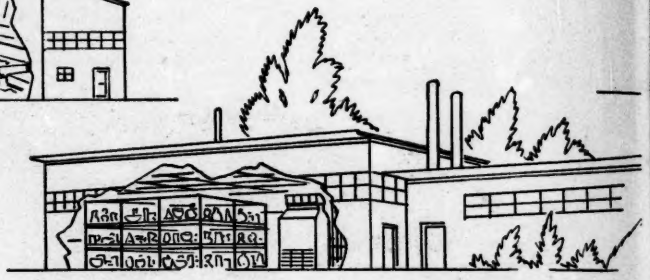

### 3. SUPERMARKET

In heating, ventilating and air conditioning large areas, Dravo Heaters can tie in with air conditioning system by using same duct work, provide year-'round comfort.

### 2. FOUNDRY

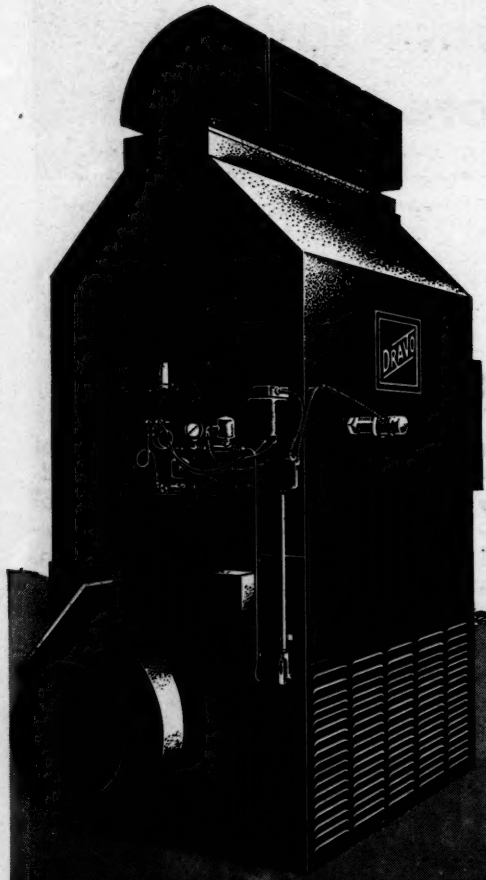
Negative pressures, caused by exhausting foul air, are balanced by tempering fresh outside air with Dravo Heaters. Atmosphere is kept healthy, constant temperatures are maintained, worker efficiency improves.





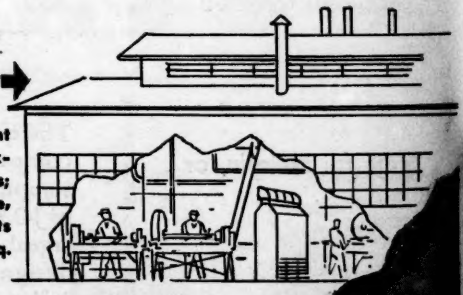
### 4. MEDIUM-TEMPERATURE CURING

In controlling temperatures and air moisture content in process manufacturing, Dravo Heaters have automatic controls, maintain constant temperature, can recirculate air to control curing process.




### 5. MACHINE SHOP

For comfort heating large plant areas, Dravo Heaters have maximum air throw in all directions; can be turned off during idle time, warm up quickly, keep fuel costs low, can heat 4,000 to 20,000 sq. ft. area, no duct work required.

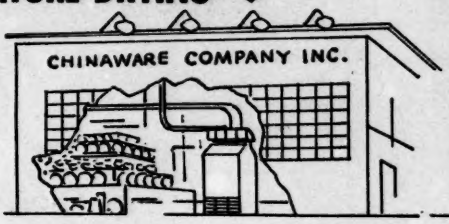


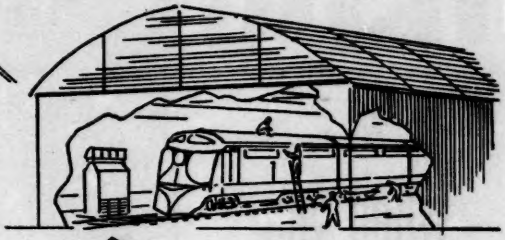
# ...ATERS.....

# 8 DIFFERENT HEATING PROBLEMS!

## 6. MEDIUM-TEMPERATURE DRYING

In removing moisture in drying operations, Dravo Heaters provide low-cost heat at even, predetermined temperatures; are automatic in operation, can use gas or oil, are readily converted.



## 7. TEMPORARY HEATING

For building construction projects where ground temperature must be kept above freezing, Dravo Heaters are quickly installed, easily moved to any location; can be later used as permanent heating plant for the new building.

## 8. RAILROAD REPAIR SHOP

In providing ample heat for repairmen in large buildings, Dravo Heaters keep heat where it's needed . . . at the working level; directional nozzles easily adjusted to suit conditions; heaters can be mounted on walls or hung from ceiling in any position.

DRAVO Counterflo HEATERS CAN SERVE SIMILAR PROBLEMS IN THESE INSTALLATIONS, TOO

**Comfort Heating and Ventilating** in schools, churches, auditoriums, laundries, restaurants, garages, factories.

**Process Drying** of wood, rubber and paint; rug drying; auto laundry operations.

**Process Curing** of concrete pipe linings, fibre pipe, paper and fibres.

DRAVO HEATERS OFFER YOU . . .

- [illegible]
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MAIL THIS COUPON FOR MORE INFORMATION . . .

DRAVO

Heating Department
Dravo Corporation
Dravo Building, Fifth and Liberty Avenues
Pittsburgh 22, Penna.

☐ Please send me Bulletin No. TU-52
☐ Please have a representative call.

Name_____

Title_____

Company_____

Address_____

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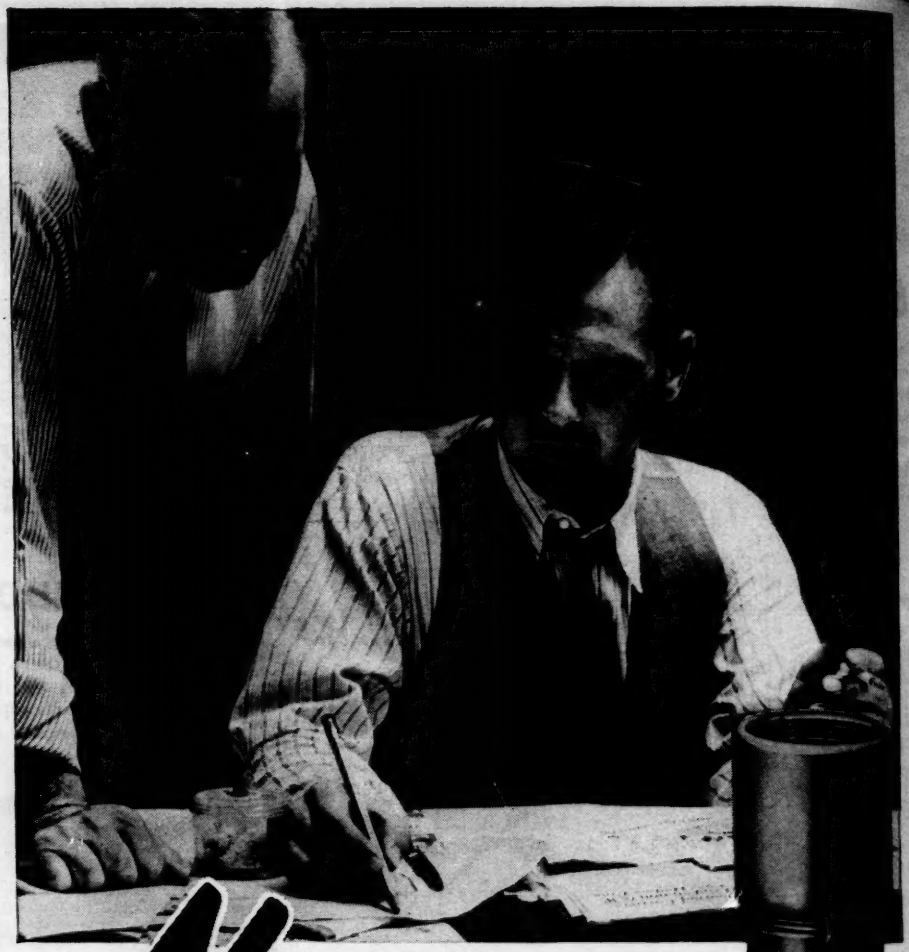


# When you figure the pipe you can be sure—

# *if it's National*

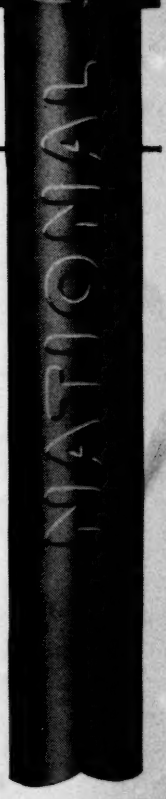
● A lot of people have faced a lot of piping problems over the last 60 years. During that time, so many of them have solved their requirements with one pipe—NATIONAL Steel Pipe—that they have made NATIONAL the largest selling pipe in the world.

Other things have helped too . . . the fact that one integrated organization has complete control of U·S·S NATIONAL Steel Pipe production, from the raw material to the finished product . . . the fact that advanced steel-making facilities and special pipe manufacturing processes are here combined with the experience of thousands of skilled craftsmen to produce steel pipe of uniformly high quality and utmost dependability.

As a result, when you decide on NATIONAL Steel Pipe you can be sure you'll always get pipe whose metallic structure, strength, sound joints, superior cutting, bending and threading properties assure easy installation and long, trouble-free performance.

These are the reasons why "old timers" swear by NATIONAL Steel Pipe and why NATIONAL is being consistently specified by the new generation of architects, engineers and contractors. In turn they have found that for low cost, easy installation and *proved* reliability in service, no other pipe quite fills the bill like NATIONAL.

So when you need an all-purpose steel pipe . . . make it NATIONAL.




**NATIONAL TUBE DIVISION, UNITED STATES STEEL COMPANY, PITTSBURGH, PA.**
**COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS**
**UNITED STATES STEEL EXPORT COMPANY, NEW YORK**

**U·S·S NATIONAL Steel PIPE**

**UNITED STATES STEEL**

**TYPHOON** HANDS YOU THE KEY TO A

# new billion-dollar market

FAIRCHILD AERIAL SURVEYS

## Cooling-Heating Units FOR THE HOME

Take a quick survey today. How many new homes going up in your area? How many old homes already have warm air ducts? It adds up to a boom market for year-round air conditioning — and it's yours with Typhoon Model S-W!

### 43 YEARS OF COMFORT ENGINEERING IN THESE EXCLUSIVE TYPHOON FEATURES!

**ONLY TYPHOON** has one-button control — summer or winter, a touch of a button brings cool air or warm . . . automatically!

**ONLY TYPHOON** has an all-copper condenser—it defies rust and corrosion, gives trouble-free service.

**ONLY TYPHOON** is a miracle of compactness—takes up less space than any other unit, can even fit into a standard closet!

**ONLY TYPHOON** has *completely* automatic changeover design—for switching from heating to cooling; no dampers to manipulate!

**SIMPLE TO INSTALL** — Just a few quick connections and within hours your Typhoon unit is ready to function.

**INEXPENSIVE TO OPERATE** — Engineered to the point of greatest economy consistent with dependable performance.

**QUIET** — Completely insulated heavy-gauge steel cabinet and floating spring base assure whisper-quiet operation.

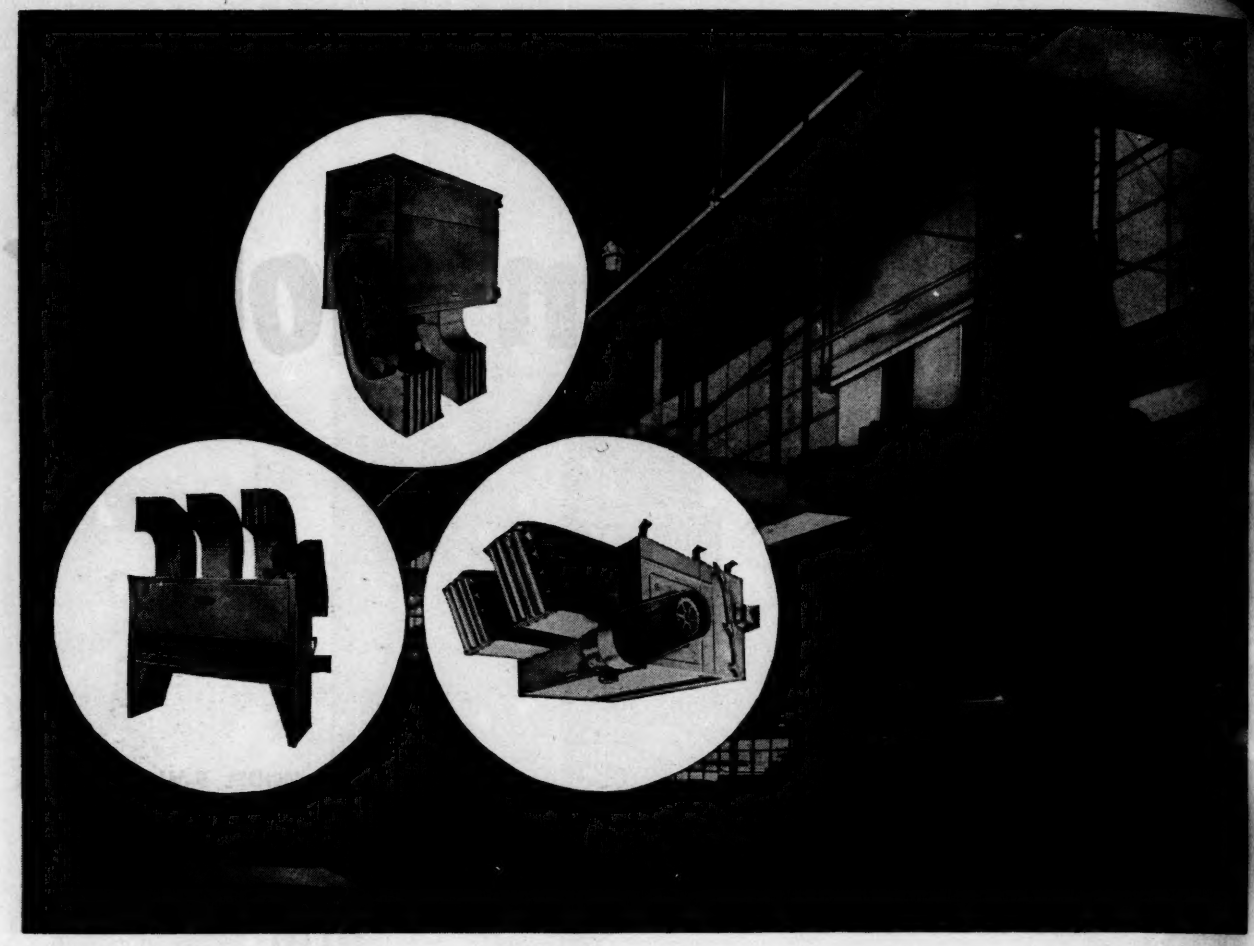
**A.G.A. APPROVED** — Perfected, Tested and Factory-Guaranteed by Typhoon.

**Year-Round Air Conditioning With ONE CENTRAL UNIT Fully Automatic**

**A TYPHOON S-W FRANCHISE** is your key to this great new home market — write, wire, phone for information today.

**TYPHOON** AIR CONDITIONING CO. INC., 794 Union Street, Brooklyn 15, N. Y.

*Specialists in Air Conditioning Since 1909.*



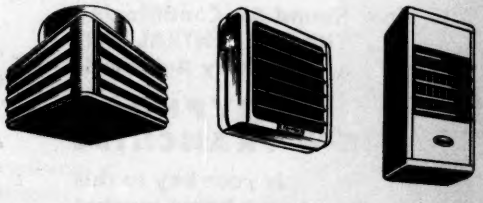
# I. S. Berlin Press finds Carrier gives better heat for bigger buildings

**It's the larger spaces** that put heating units to a real test. That's why the I. S. Berlin Press, 3201 N. Kimball Ave., Chicago, relies on Carrier blower-type Heat Diffusers to heat their warehouse. Cold floors and drafty corners are never around in even the biggest warehouses, hangars, factories or garages with Carrier Heat Diffusers on the job. They bring in fresh outside air, warm it quickly and evenly, and send it to every cranny of the building through multiple discharge outlets with adjustable louvers.

**Famous Aerofin coils** for steam or hot water, as used in all Carrier Heat Diffusers, are available in either U-bend or Non-Freeze type. When Aerofin Non-Freeze coils are used, there's no need to install low limit protective controls or to temper outside air, because these coils just *will not freeze*, even when handling 100% outside air at below freezing temperature!

**Another advantage:** Carrier Heat Diffusers are of sectionalized construction, easily installed, and can be readily rearranged for floor, wall or ceiling mounting.

**For steam or hot water** Carrier blower-type Heat Diffuser models 46P, Q, R are available in 6 sizes, to 2,390,000 Btu's per hr. at 2-lb. steam. Air-handling capacities to 31,000 cfm. Write for our informative catalog, "Carrier Heat Diffusers." Carrier Corporation, Syracuse, New York.

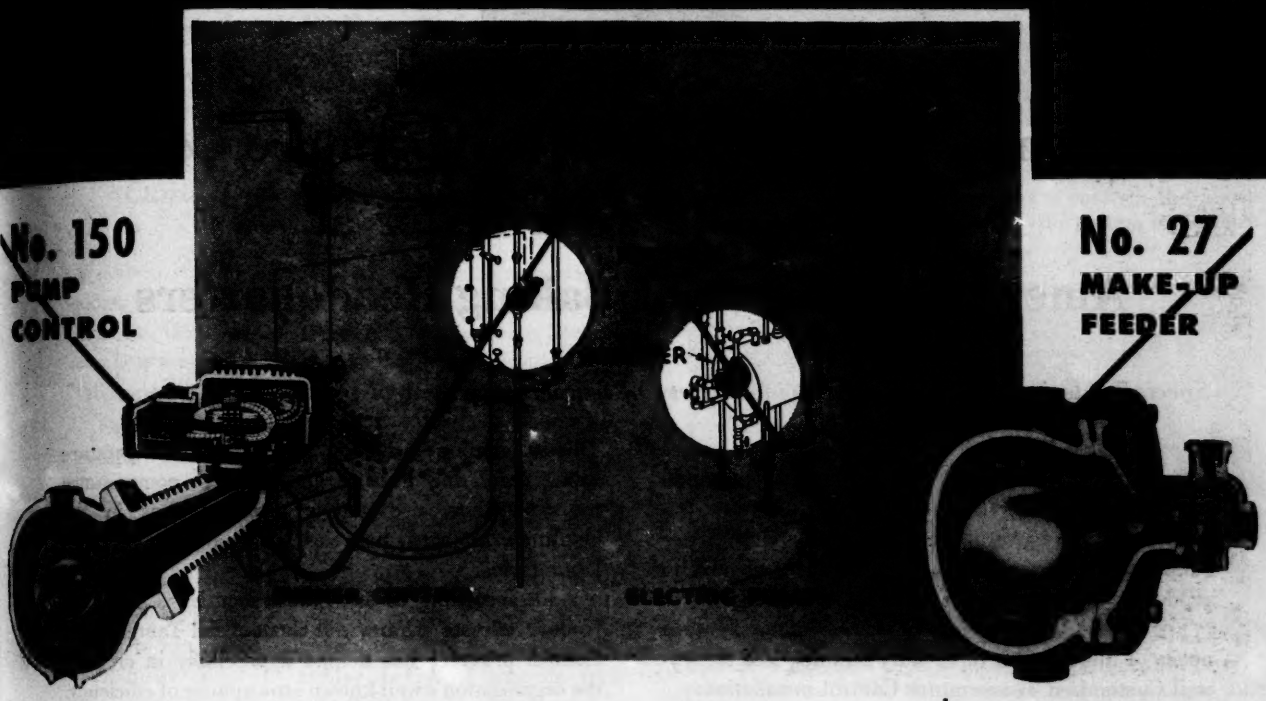


**For smaller spaces,** Carrier propeller-fan type Unit Heaters: Four-way Directed-flo vertical discharge model 46S (left), 7 sizes, 82,000 to 500,000 Btu's, for steam or hot water; horizontal discharge model 46U (center), 10 sizes, 21,000 to 200,000 Btu's, for steam or hot water; and gas-fired model 46T (right) and 46TD (duct type, not shown), 7 sizes, 70,000 to 230,000 Btu's, AGA-approved for all gases.

Carrier

*Air Conditioning • Refrigeration • Industrial Heating*

# Here's the GREAT COMBINATION for those Medium Pressure Boilers




### Pump Control, Low-Water Fuel Cut-off and Low Water Alarm

The No. 150 has two mercury switches. One provides a circuit for starting and stopping feed pump; the other has circuits for low-water cut-off of the burner and for low-water alarm bell if desired. Underwriters' approved.

It is built throughout to stand up under pressure and temperature encountered in boilers of any type or size; maximum steam pressure, 150 lbs. It has no stuffing boxes to cause trouble. Packless construction is provided by extra-heavy monel sylphon bellows. Switch leads have heat-impervious, porcelain-bead insulation. Mechanism is sealed to guard against tampering. Thousands of installations attest the dependability of this control.

## How to use them . . .

This is the team of thoroughbreds that takes all the worries and troubles out of water level and feed pump control for medium pressure boilers—boilers with steam pressures up to 150 psi.

The drawing above shows the simple hook-up. The No. 150 controls the boiler feed pump directly from the boiler water level. This holds the boiler water level within close limits that assures maximum steaming efficiency and fuel economy. Any deficiency in the returns is at once replaced by the No. 27 Make-up Water Feeder on the receiver.

An extra switch on the No. 150 provides circuits for cutting off burner and sounding low water alarm in the event of some emergency such as current interruption in the pump circuit or failure of make-up water supply.

Yes, this set-up gives you close control of the water level and maximum protection from low water. Ask for simple installation and wiring diagrams.

### Float-operated make-up water feeder for receiving tanks

The No. 27 is used to supply make-up water to maintain the minimum water level required in condensate receiving tanks. Its large water feeding capacity makes it particularly effective in this service. Rugged, all bronze and stainless steel valve mechanism assures long life. The diagram shows how the No. 27 is installed with 1-inch equalizing pipe and ¾" water feed pipe. Every detail of the No. 27 speaks quality construction. It is for tank pressures up to 35 lbs. and water supply pressure up to 100 lbs. Other well-built McDonnell Make-up feeders are available to meet almost all installation conditions.

**McDONNELL & MILLER, Inc., 3500 N. Spaulding Ave., Chicago 18, Ill.**

*Doing One Thing Well*

Your Jobber Stocks Them

# McDONNELL

# How Honeywell Customized Temperature Control helps people work better at American Institute of Baking Headquarters

*Specially designed system meets wide variety of temperature control problems*

One of the reasons the bakery goods you eat today are better bakery goods is because there's an organization called the American Institute of Baking.

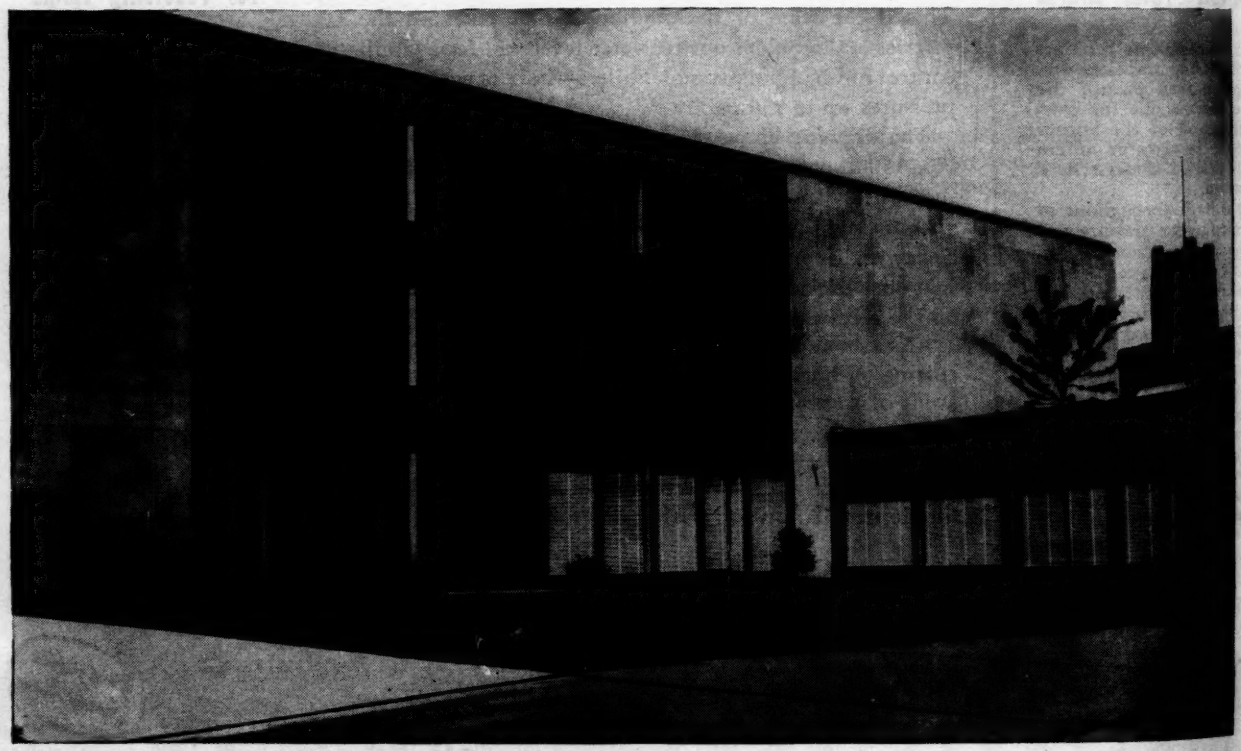
In its headquarters the Institute teaches better baking methods and conducts research dedicated to producing superior bakery products.

Specially designed to meet the variety of temperature needs of this modern three-story building is a Honeywell Customized Temperature Control installation.

This installation—with fourteen different temperature zones regulating heating and cooling—compensates for occupancy, use and exposure factors in the institute's kitchens, bakeries, classrooms, offices and laboratories.

And, according to Institute executives, the ideal "indoor climate" Honeywell Customized Temperature Control provides has helped appreciably in creating the organization's well-known atmosphere of efficiency.

*Chicago headquarters building of American Institute of Baking was designed by Skidmore, Owings & Merrill*



*For Comfortable, Even Temperature in New or Existing Buildings— of any size—specify Honeywell Customized Temperature Control*

Whether it's an office, factory, hospital, apartment, store, school, garage—or any size building—new or existing, Honeywell Customized Temperature Control can help meet your clients' heating, ventilating, air conditioning and industrial control problems.

Once equipped with Honeywell Customized Temperature Control, they'll have an ideal indoor "climate" —and save fuel besides.

And with a complete line of pneumatic, electric and electronic controls to choose from, Honeywell Customized Temperature Control offers you the greatest flexibility in design.

Then, too, when it comes to performance, Honeywell-built controls assure years of trouble-free operation. And they're backed by the finest service organization in the controls industry.

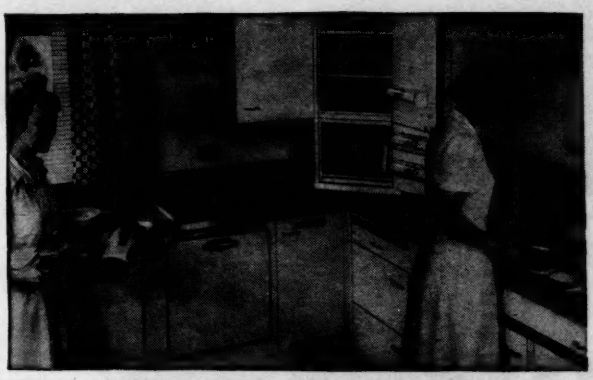
For full facts, call any one of the 96 local Honeywell offices. Or mail the coupon today.

*Kasmir "Casey" Lemeka, American Institute of Baking's chief engineer, says:* "First of all, I like our Honeywell Customized Temperature Control installation because it keeps people happy by furnishing constant comfort — everywhere in the building. But from my standpoint, another feature that's mighty important is the need for very little maintenance. In short, the system works right—and doesn't need to be babied."

MINNEAPOLIS **Honeywell**

*First in Controls*

**Honeywell Customized** Temperature Control helps promote worker efficiency by preventing offices from becoming uncomfortably hot—or too cold. In the above office—located in heating zone 1—the system often must compensate for strong lake winds.



**The test kitchen** is located on the second floor in temperature zone 9. The thermostat in this temperature zone easily compensates for extra heat from the ovens and from solar radiation on sunny days, thus providing ideal comfort and raising worker efficiency the year 'round.

**Zoned temperature** control is extremely important in the large lecture room on the ground floor—located in temperature zone 2. Besides compensating for many large windows facing south, the thermostat keeps the temperature just right—for large or small classes.

MINNEAPOLIS-HONEYWELL REGULATOR CO.
Dept. HV-12-246, Minneapolis 8, Minnesota
Gentlemen: I'm interested in learning more about Honeywell Customized Temperature Control.

*Name*_____

*Firm Name*_____

*Address*_____

*City*_____ *Zone*____ *State*_____

# There's no REAL substitute for

# CHASE® COPPER WATER TUBE

## For hot and cold water lines

Why risk a substitute when you know you just can't beat Chase Copper Water Tube for domestic hot and cold water lines! Chase Copper Water Tube will not clog with rust. For new construction use Chase Type L, hard temper, and Chase solder-joint fittings. Available in 20 foot straight lengths hard or soft temper. Type L, soft temper, also comes in 60 foot and 100 foot coils that can be snaked behind walls and under flooring.

## For underground piping

Look at all the advantages in using Chase Type K Copper Water Tube soft temper, for underground piping! It is so ductile it can be bent around rocks and obstructions. Settling won't harm it as it moves with the earth. Chase Copper Water Tube comes in coils in lengths up to 100 feet. This means fewer fitting connections. All Chase Copper Water Tube is readily bent and cut.

Chase® BRASS & COPPER

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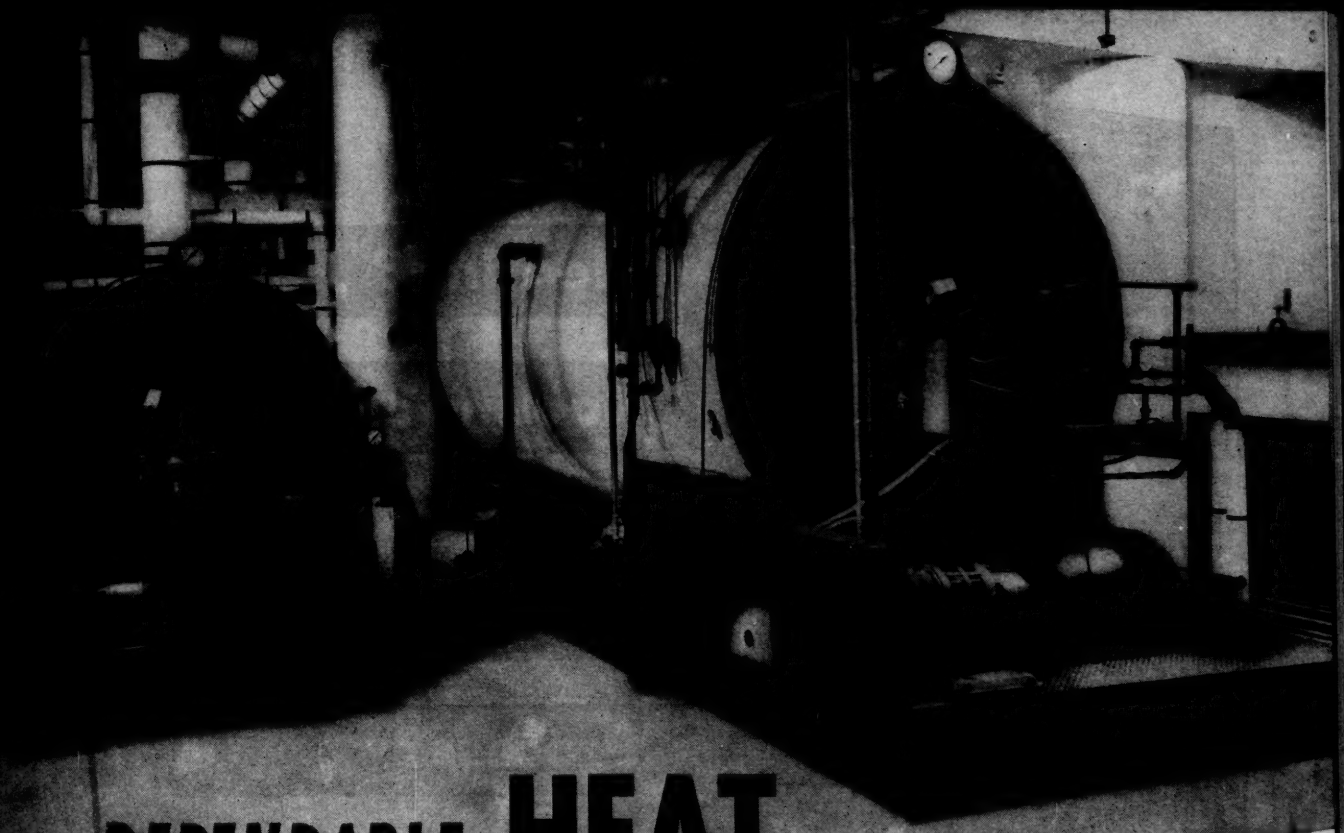
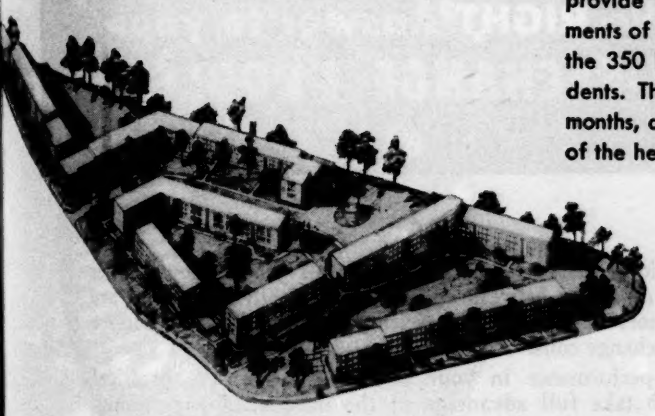


# DEPENDABLE HEAT for MULTIPLE HOUSING

## These two SUPERIOR STEAM GENERATORS

provide dependable low-cost heat and hot water for 177 apartments of the Brookline, Mass. Housing Authority. Throughout the winter, the 350 h.p. unit supplies both heat and hot water for the 661 residents. The smaller 125 h.p. unit provides hot water in the summer months, and can be used to supplement the 350 h.p. unit at the peak of the heating season.



Requiring minimum space and minimum supervision, while operating at thermal efficiencies guaranteed to exceed 80%, Superior Steam Generators are widely specified by architects and consultants for economical heating in all types of multiple housing, as well as for industrial heating and the generation of steam for process.

*Superior Steam Generators are fully automatic; burn oil, gas, or both. 18 sizes from 20 to 600 b.h.p. for pressures up to 250 p.s.i. or for hot water. For complete details, write for Catalog 419.*

for performance you can **BANK** on

**SUPERIOR STEAM GENERATORS**

**SUPERIOR COMBUSTION INDUSTRIES INC.**
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

**Heating?**

**Cooling?**

**Air Conditioning?**

**Process?**

## Here's How to Get the RIGHT Answer to your HEAT-EXCHANGE PROBLEM

The right ratio of surfaces – the right materials – the right velocities – the right proportion between coil area and depth . . . there are dozens of factors that affect the efficiency, maintenance and service life of heat-exchange coils.

For best performance in your own application, the practical approach is to take full advantage of the unequalled engineering, research and design skill – the unequalled manufacturing and testing facilities – which Aerofin offers you.

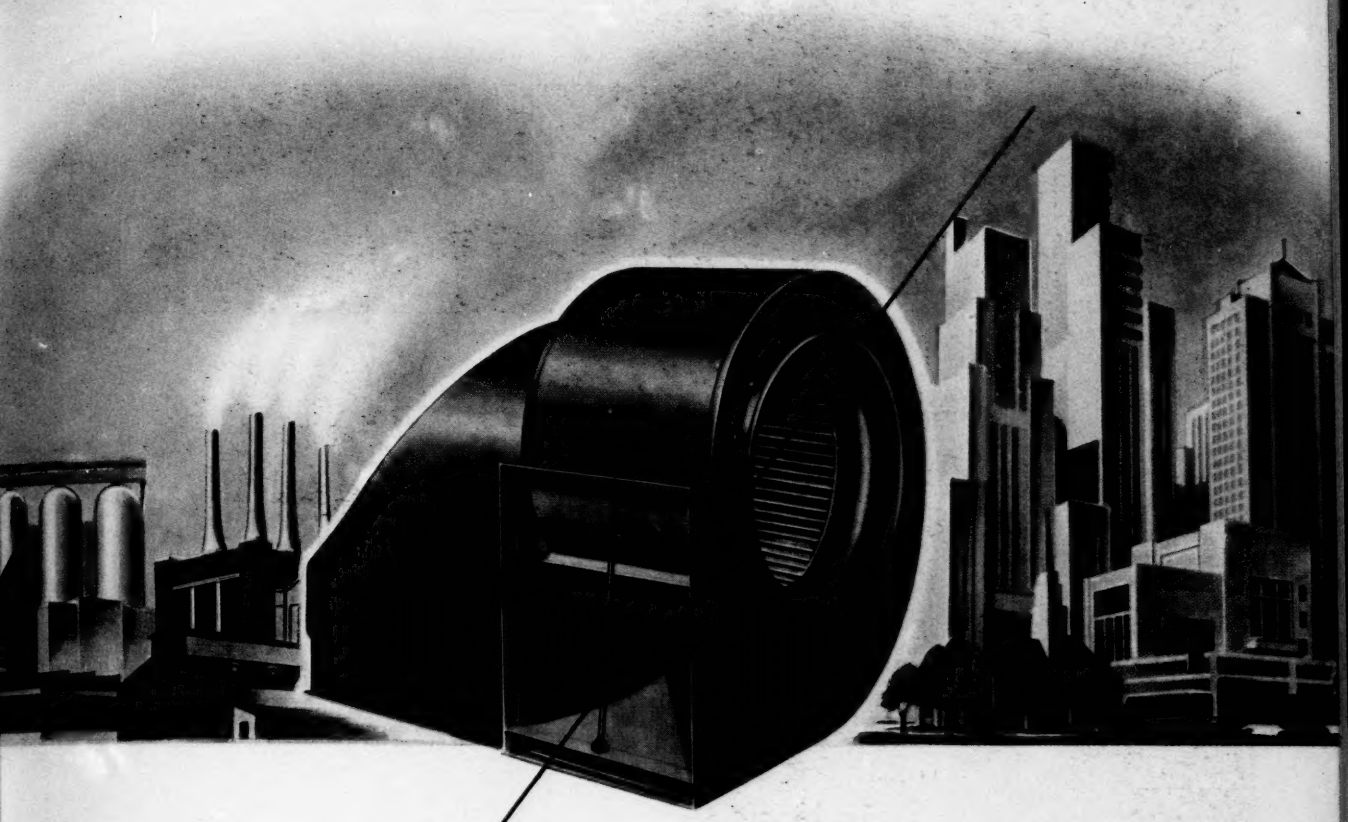
To get the *right* answer – ask the Aerofin man.

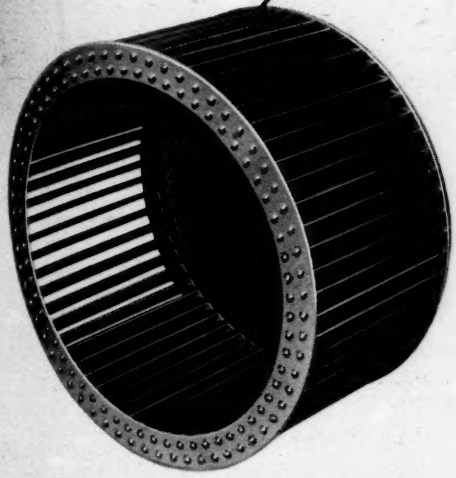
Aerofin is sold only by manufacturers of nationally advertised fan assembly apparatus. List on request.

# AEROFIN CORPORATION

410 South Geddes St. SYRACUSE 1, N. Y.

**American Blower — a time-honored name in air handling**





The heart of an American Blower Utility Set is this dynamically balanced Sirocco wheel which provides large volumetric capacities at low peripheral speeds.

Need air in your business?

Want a "work horse" that has proved to be a good investment in hundreds of industries?

Then, put these time-proved, quality-built American Blower Utility Sets to work. They are unsurpassed for general ventilation where duct systems are required.

There's an American Blower product for every air handling need — for process work, for pressure duties, for ventilating, heating, cooling, air conditioning.

Just call one of our branch offices for data.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
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Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION

# AMERICAN BLOWER

YOUR BEST BUY IN AIR HANDLING EQUIPMENT

*Serving home and industry*

STANDARD • AMERICAN BLOWER • ACME CABINETS • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

# Sailor Beware! The Old Man of The Sea!

WHO has not read of Sinbad, as told in the Arabian Nights by glamorous Scheherazade?

Shipwrecked on a strange island, the unfortunate sailor came upon a weak old man. Moved by compassion, Sinbad took the feeble fellow on his back, carried him over the brook, gathered fruit and fed him. But when Sinbad asked him to get down, the old man refused, wrapping his legs about his neck, almost strangling him.

The sailor fainted and fell down, yet the old man clung ever closer. He rained blows on Sinbad, driving him about without rest, to pick fruit and do his pleasure. This went on and on, until the desperate sailor made wine from wild grapes to appease his own plight. One day noting Sinbad's pleasure, the old man snatched a gourd of wine and gulped it down. Completely drunk, he loosened his grip and Sinbad threw him off. Saved by a passing ship, his rescuers said, "You are the first ever to escape strangling by the Old Man of the Sea".

Dating back hundreds of years, the Old Man is an allusion familiar to everyone. He is a warning figure today. Our nation, surviving the storms of two world wars, wanders down strange ways. With kindly intent and glorying in its own strength, America is tempted to shoulder the Old World and its age-worn problems. But weak and feeble as the Old World appears to be, let us beware! How easy to assume a burden which would quickly exhaust our strength, strangle us as a nation, and in the end leave the world as weak and exhausted as it was before our foolish undertaking!

QUALITY YOUNGSTOWN SERVICE

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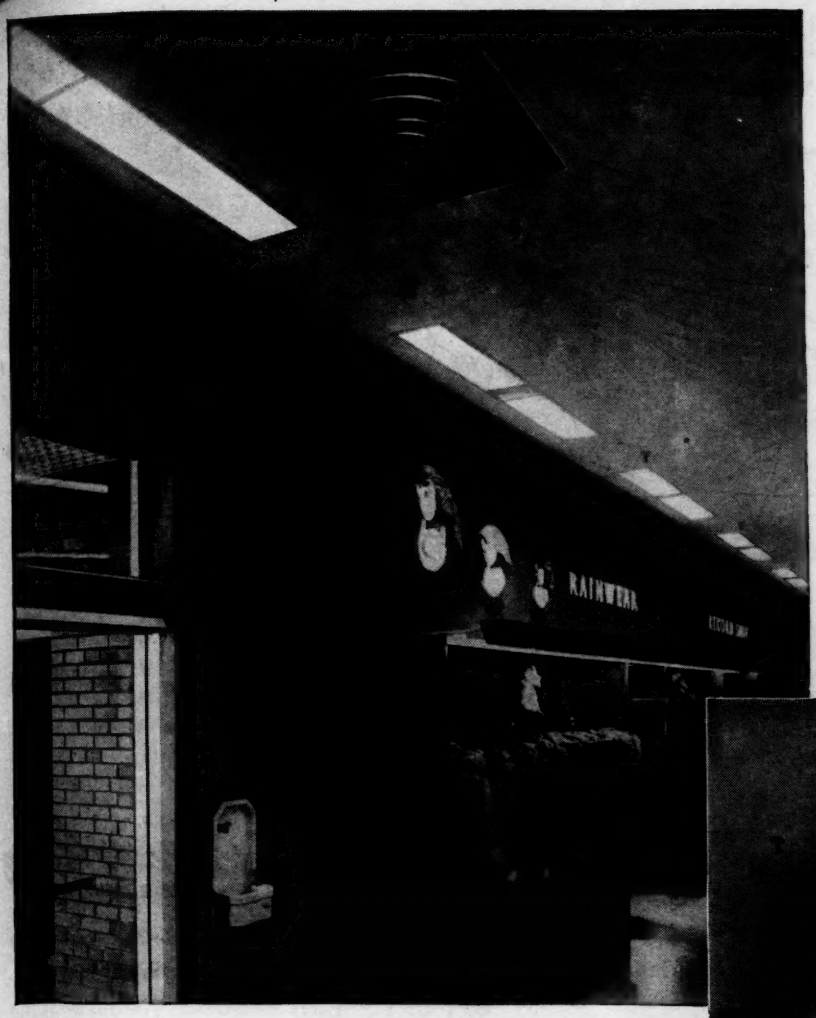
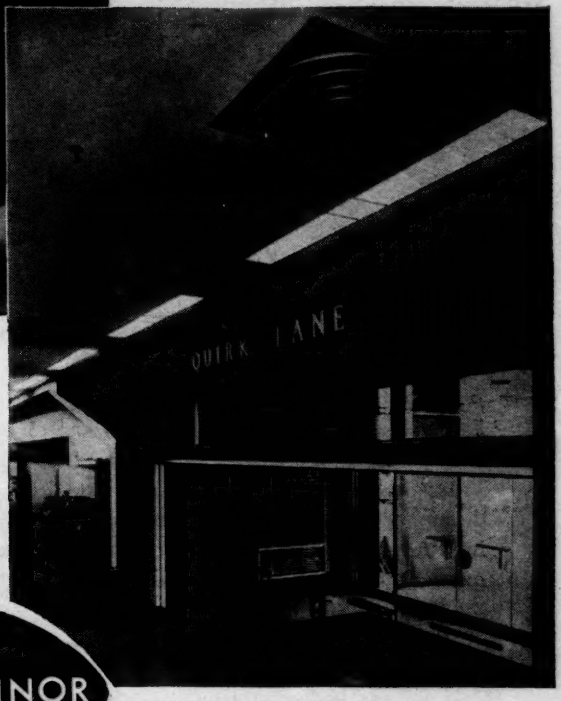
MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

RAILROAD TRACK SPIKES - CONDUIT - HOT AND COLD FINISHED CARBON AND ALLOY BARS - PIPE AND TUBULAR PRODUCTS - WIRE - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - RODS - SHEETS - PLATES.





Design Engineers: Abbott, Merkt and Company, Inc.
Design Architects: Kahn and Jacobs
Consulting Engineers: Edward E. Ashley

NEW HECHT STORE chooses...

● Handsome efficient Kno-Draft Air Diffusers bring conditioned air — gently, evenly, and *without drafts* — into The Hecht Co.'s new Parkington-Arlington store at Arlington, Virginia.

Here, as with every Kno-Draft job, a lot less preliminary figuring had to be done because Kno-Draft Air Diffusers are adjustable *after* installation. This not only reduces slide rule work but assures the customer the exact comfort level desired. Air volume and direction of flow can be regulated with no other tool than a screw driver.

Kno-Draft *Adjustable* Air Diffusers are being specified for more and more commercial and industrial applications. Get the full story on their many engineering advantages. Mail the coupon today to W. B. Connor Engineering Corporation, Danbury, Connecticut.

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**kno·draft®**

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**Dept. J-122, Danbury, Connecticut**

Please send me the *new edition* of the Kno-Draft Data Book—without obligation, of course.

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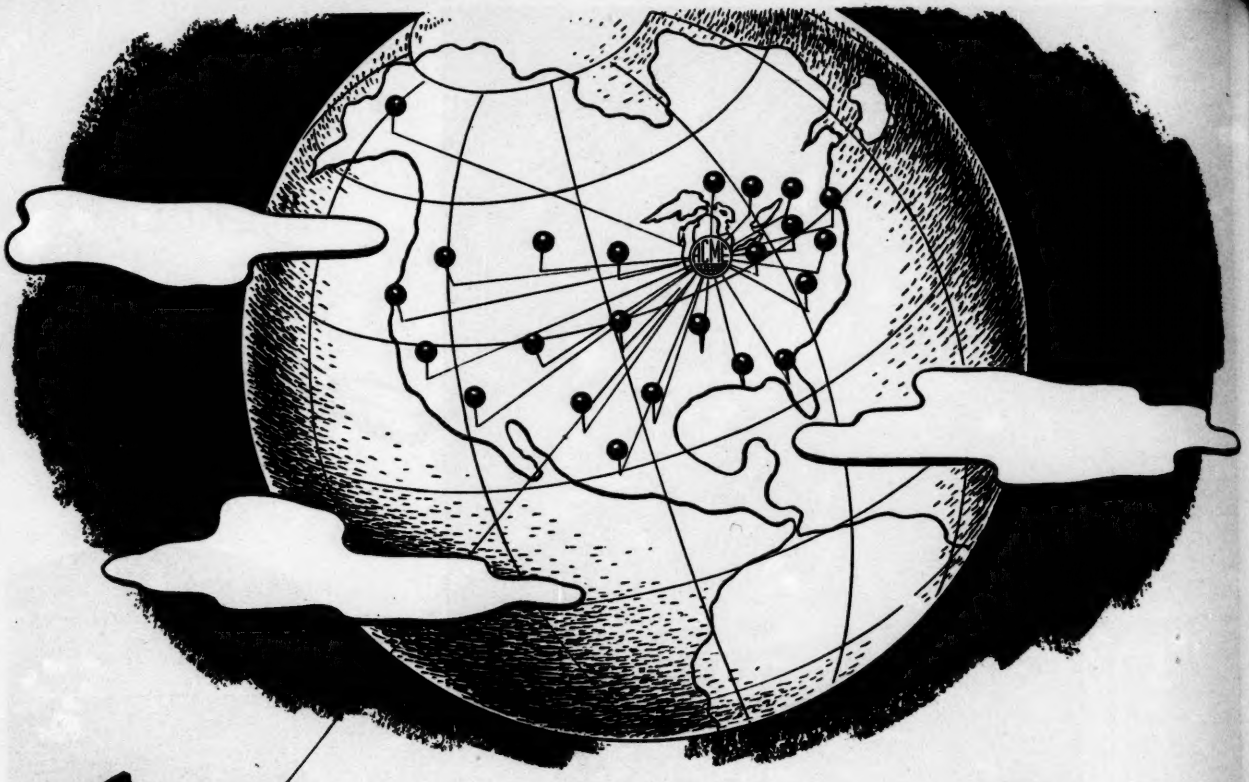

# *Acme* products are in use *Everywhere*

In every major industrial center, you will not have far to go—to see a successful and efficient installation of *ACME* Refrigeration or Air Conditioning equipment. In offering practical solutions to temperature control problems, *ACME* Engineers have had an opportunity to study normal and abnormal temperatures, humidity and prevailing conditions. From this long experience *ACME* Engineers have developed a line of refrigeration and air conditioning components that meet practically every requirement of the Refrigeration and Air Conditioning Industry. Whatever your immediate problem may be, the chances are that the nearest *ACME* representative can show you an actual installation of *ACME* products which is successfully meeting requirements similar to yours. *ACME* Products have been tried and are in actual use in practically every climate under practically every possible condition. You can depend on this long established and time tested line of major refrigeration components to give you efficient, low cost, long lasting service.

## THE COMPLETE *Acme* LINE INCLUDES

**Freon Shell and Coil, Shell and Tube and Ammonia Condensers.**
***Dry-Ex Water Coolers**
***Hi-Peak Water Coolers**
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**Evaporative Condensers**
**Cooling Towers**
**Liquid Receivers**
**Air Handling Units**

* TRADE MARK

*Free Consultation with ACME Engineers is yours for the asking.*
*Write ACME INDUSTRIES, INC., Dept. HV, Jackson, Michigan*

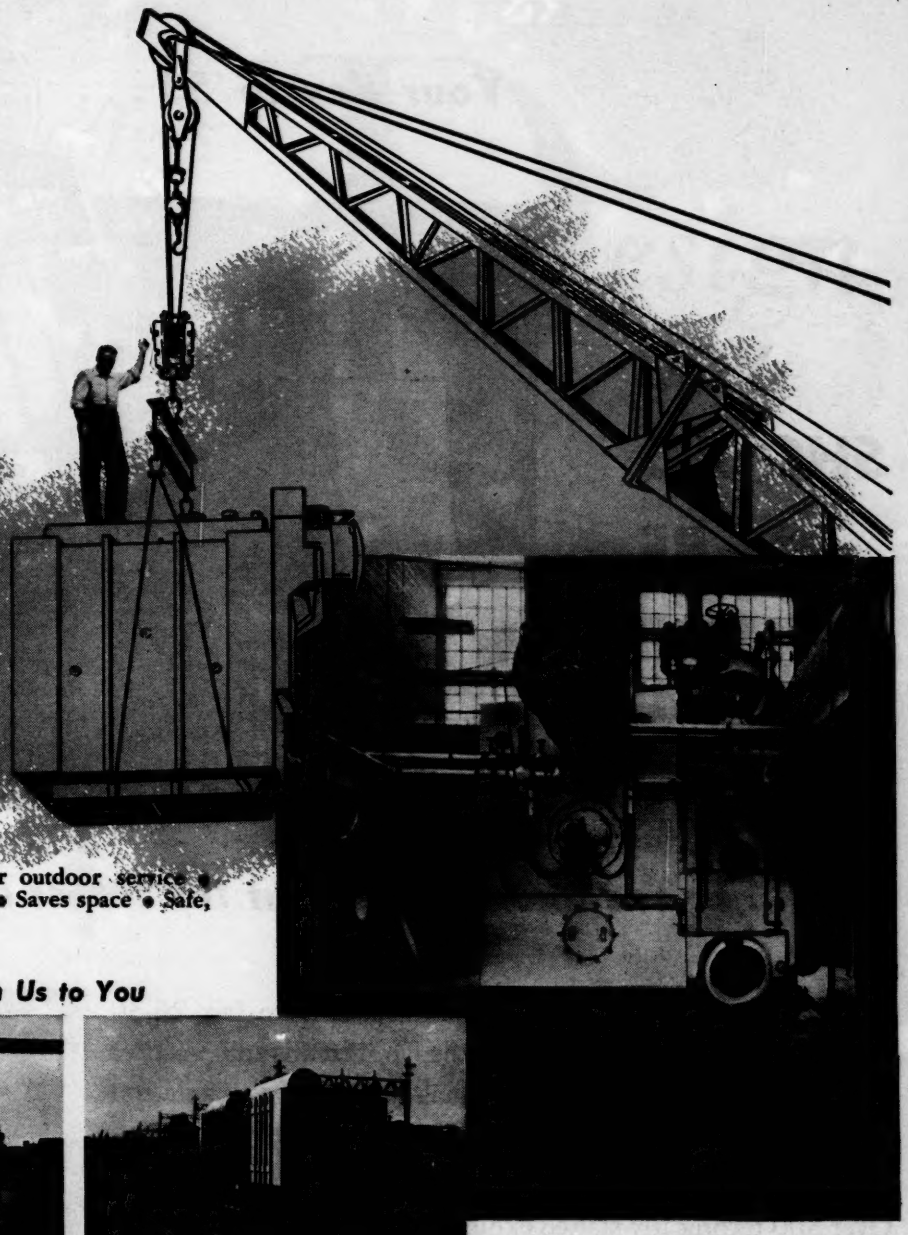
ACME PRODUCTS

**ACME INDUSTRIES, INC.,** JACKSON, MICHIGAN, U.S.A.
**Refrigeration and Air Conditioning Division**

*CONTINUOUSLY SERVING THE AIR CONDITIONING AND REFRIGERATION INDUSTRY SINCE 1919*

IF YOU WANT TO

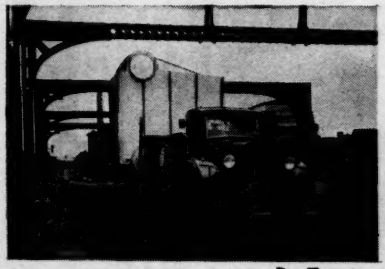
# Bring Steam Costs Down



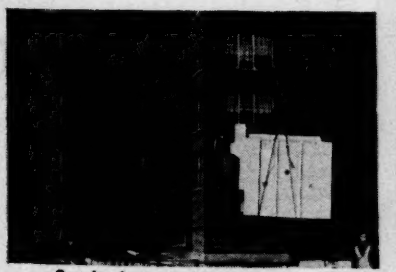
**CONSIDER THIS**
**Factory-assembled, Self-contained B&W Integral-Furnace Boiler, Type FM**

• Saves erection time and cost • Meets wide range of services • Handles quick load changes • Fast steaming • Low maintenance • Easy accessibility • Suitable for outdoor service • Burns oil and or gas • Saves fuel • Saves space • Safe, automatic operation.

***It Is Easily Shipped from Us to You***



By Truck . . By Rail



Set it down where you want it . . . Set it up in a hurry

There's no law against buying more than one FM unit if you need BIG BOILER capacity. Many companies have, and pocketed the money they would otherwise have spent tearing their buildings apart to put the boiler in. Ask your nearest B&W man to explain the economical service you can expect from Type FM boilers . . . or send for Bulletin G-72.

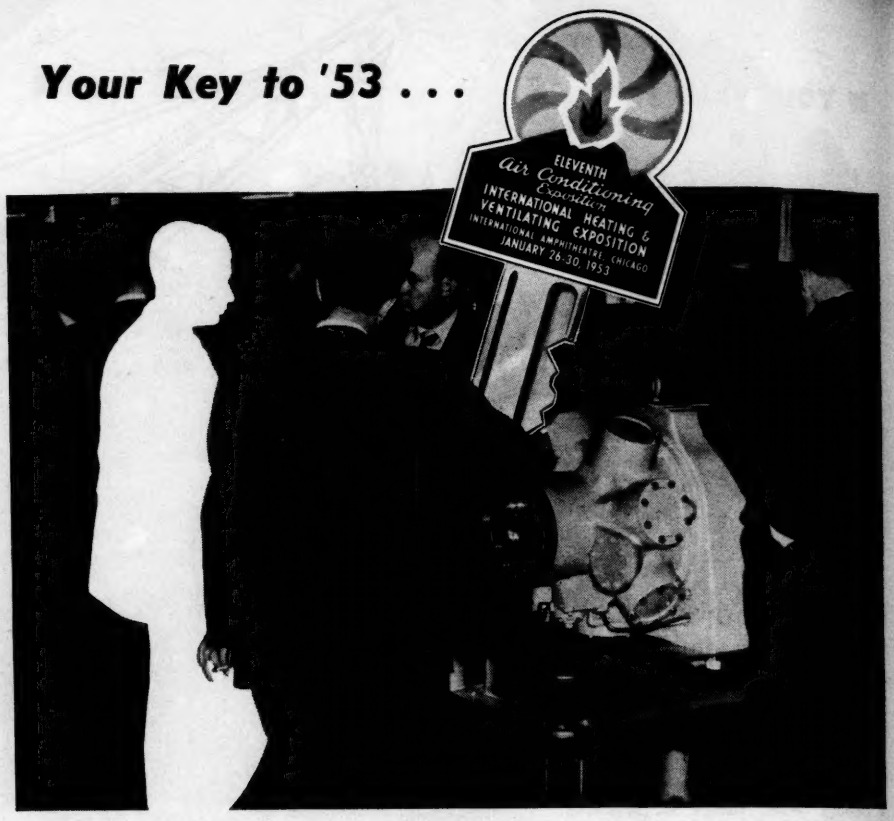
**THE BABCOCK & WILCOX COMPANY**
***BOILER DIVISION***
**85 Liberty Street, New York 6, N. Y.**

**BABCOCK & WILCOX**

G-564

## *Your Key to '53 . . .*

# YOU SHOULD BE HERE




## *. . . to see and learn about the latest developments*

*in*

# HEATING VENTILATING AIR CONDITIONING

At Chicago's International Amphitheatre, from Jan. 26-30, you'll SEE *all* that's new, LEARN the latest trends and practices, GET a wealth of new ideas, and make a host of valuable contacts during the 11th International Heating and Ventilating Exposition.

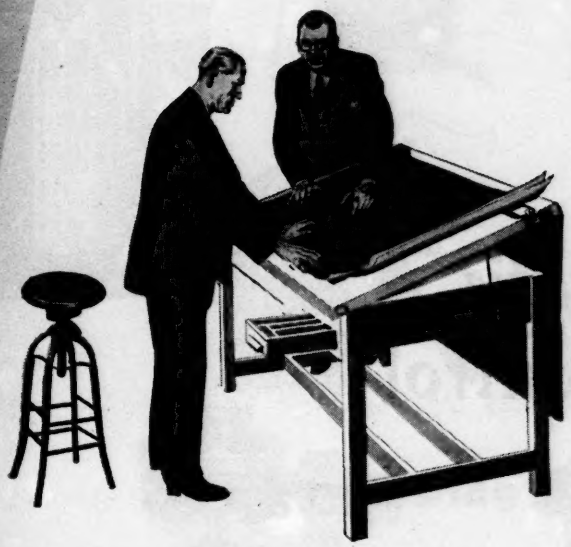
Over 300 technically-staffed exhibits will provide an exceptional opportunity for you to get a first-hand look at the latest products for conditioning air in all types of buildings, plants, and homes . . . compare hundreds of new, improved items, large and small . . . find cost-saving solutions to your problems by discussing them with engineering specialists. You'll be MONTHS AHEAD in FIVE DAYS.

Arrange now to ATTEND and BENEFIT from this exposition of ideas and progress; the largest of its kind ever held.

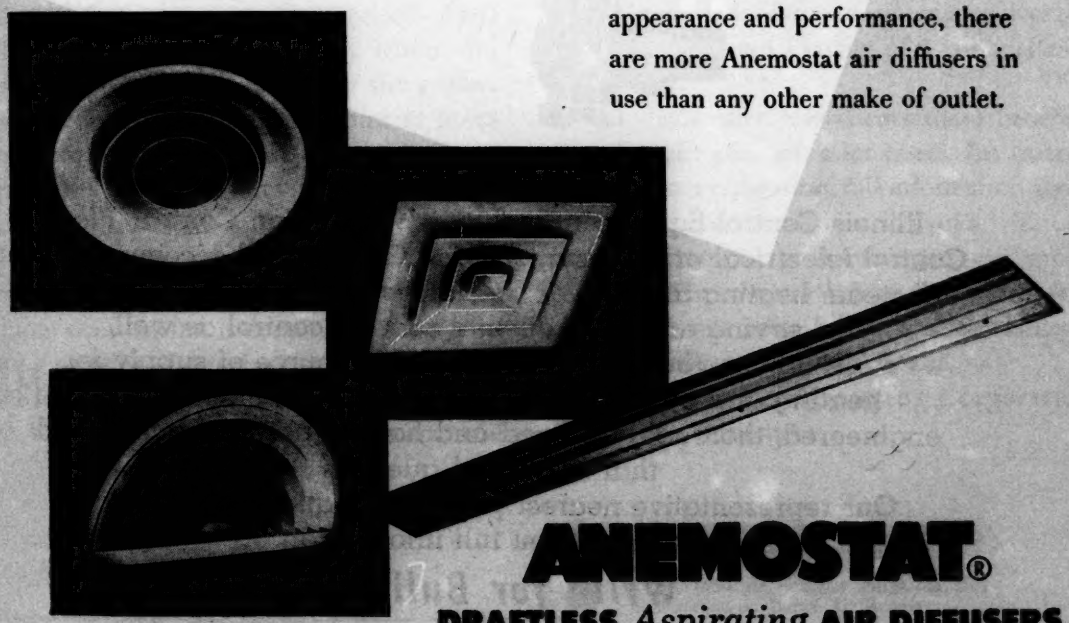
*11th Air Conditioning Exposition*
INTERNATIONAL HEATING & VENTILATING EXPOSITION
Under Auspices of American Society of Heating & Ventilating Engineers
MANAGEMENT INTERNATIONAL EXPOSITION CO.

INTERNATIONAL AMPHITHEATRE
**CHICAGO**
**JAN. 26-30**

# *Anemostat offers more latitude in* Design



Good interior designs are easy to achieve with Anemostat air diffusers. A choice of round, square, semi-circular and straight line shapes gives architects and engineers *design freedom* . . . in every case without sacrifice of function. Every type incorporates Anemostat's exclusive aspiration principle and thus provides true draftless comfort. Because they excel in both appearance and performance, there are more Anemostat air diffusers in use than any other make of outlet.



**ANEMOSTAT®**

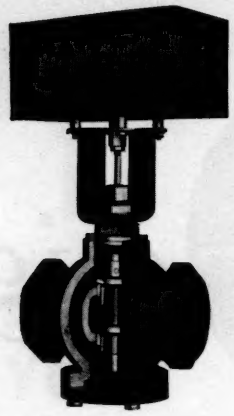
**DRAFTLESS *Aspirating* AIR DIFFUSERS**

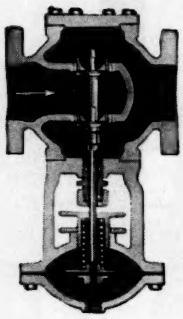
**ANEMOSTAT CORPORATION OF AMERICA**

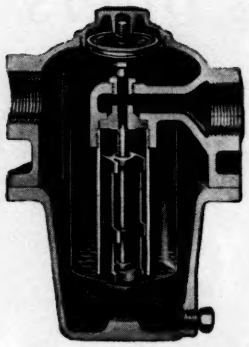
**10 EAST 39th STREET, NEW YORK 16, N. Y.**

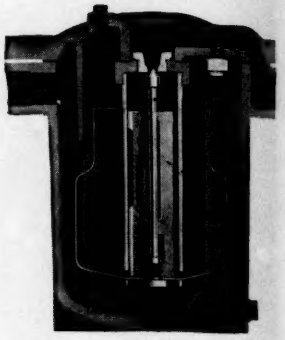
**REPRESENTATIVES IN PRINCIPAL CITIES**

*"No Air Conditioning System Is Better Than Its Air Distribution"*





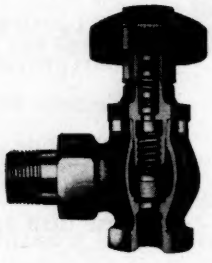


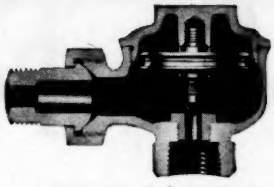


# ILLINOIS

## *Automatic*

## Steam and Fluid Control Equipment





Illinois Control Equipment includes Combustion Control, Flow Control (electrical or pneumatic), Zone Control and a complete line of steam heating and power specialties for heating comfort and fuel saving and for industrial process control as well.

"ILLINOIS" is your logical, dependable source of supply for heating and power specialties that have been carefully engineered, thoroughly proved and have a performance record that is beyond question.

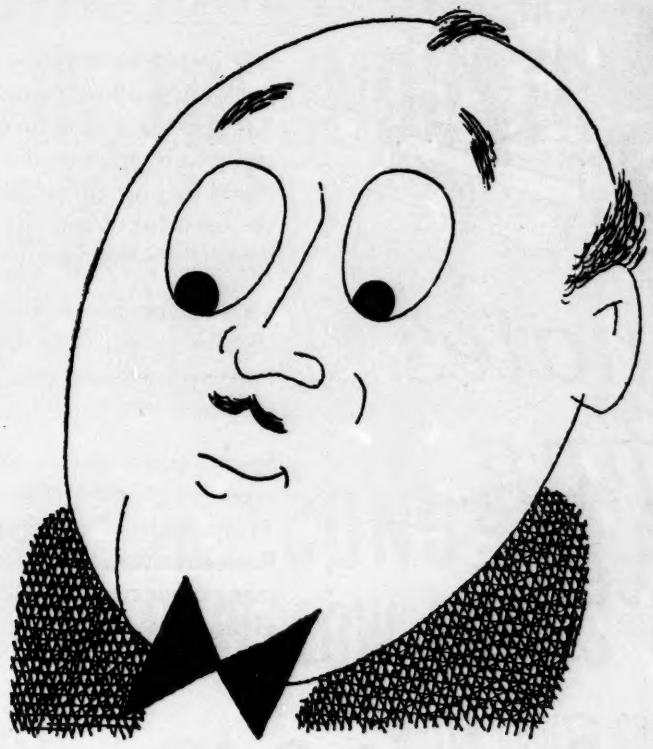
Our representative nearest you in our nation-wide service will give you full information.

***Write for Bulletins***

**ILLINOIS ENGINEERING COMPANY**

INCORPORATED 1900

**RACINE AVENUE AT 21ST STREET • CHICAGO 8**



# Going DOWN

**THE COST OF AIR CONDITIONING AND VENTILATING** drops markedly when you make Dorex Air Recovery part of the system. That's because only about one-third as much outside air has to be heated or cooled. Dorex Air Recovery "manufactures" *fresh* air by taking the gaseous impurities and odors out of *used* air.

Dorex Air Recovery has more than 20 years experience behind it. It forms an integral part of more than 10,000 air conditioning and ventilating systems. From these we find that every $100 invested in Dorex Air Recovery should save some $400 on original equipment; and every $1 spent for Dorex maintenance over the years should return a saving of $4 in operating costs.

Why not offer *your* clients these benefits? You'll make your job a lot easier. Let us send you, without obligation, full information about Dorex Air Recovery—how it works, who uses it, what you and your customers can expect from it. The coupon below clipped to your letterhead will bring our fact-packed bulletin: "How To Manufacture Fresh Air."

W. B. Connor Engineering Corporation, Danbury, Connecticut.

W. B. CONNOR ENGINEERING CORPORATION

dorex® air recovery

**W. B. CONNOR ENGINEERING CORP.**
**Dept. B-122, Danbury, Connecticut**

Please send me, without obligation, full information on Dorex Air Recovery.

Name.....

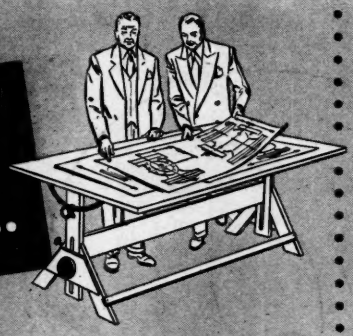
Position.....

Company.....

Street.....

City.....Zone.....State.....

HOW SPENCE DESIGN...

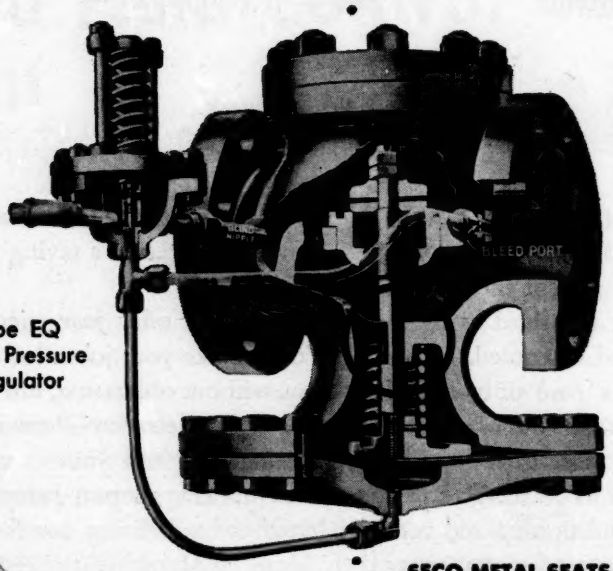


# *eliminates stuffing boxes*

All Spence main valves and most pilots are built without stuffing boxes. This packless construction is made possible by the use of a large balanced metal diaphragm which eliminates the need for closely fitted parts. Result? More accurate regulation.

Valve stem wear is also reduced in the Spence packless design. Result? Low maintenance, years of trouble-free service.

Spence makes a wide line of automatic regulating valves: Pressure, Temperature, Differential Pressure, Back Pressure, Pump Governors and many other types. Write for bulletin 100 giving full details.




Type EQ
Back Pressure
Regulator

*A few other design features:*

**SECO METAL SEATS AND DISCS**— Durable SECO Metal resists wiredrawing. More than twenty years of experience in thousands of installations has failed to produce a single case where SECO Metal has been cut by steam.

**PROTECTED SPRINGS**— The internal springs in the Spence Main Valve and Pilot are out of the path of the steam or other fluid flowing through the valve. They operate at low unit stress for exceptionally long life.

**METAL DIAPHRAGMS** — Located in a cooled zone with a condensate seal above and below, never have to be replaced under normal conditions.

Spence

**SPENCE ENGINEERING COMPANY, INC.**
WALDEN, NEW YORK

# ONE OF THE MOST COMPLETE LINES IN THE INDUSTRY

# NEW improved

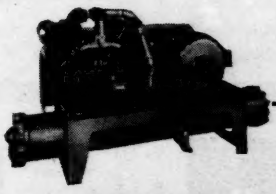
# *Curtis* CONDENSING UNITS

## at NEW, LOW PRICES

*All with these Famous Curtis Features:*

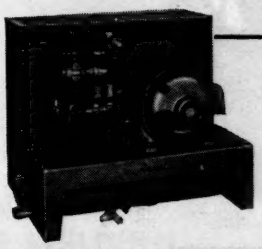
- TIMKEN TAPERED ROLLER BEARINGS
- POSITIVE LUBRICATION
- OIL LEVEL SIGHT GLASS
- SLOW SPEED OPERATION FOR LONG LIFE AND HIGH EFFICIENCY

*Plus a complete line of packaged units in six sizes 2-3-5-7½-10-15-H.P.*



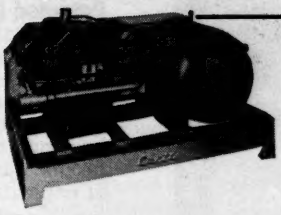
### WATER COOLED CONDENSING UNIT

Low, Regular and High Temp., from ⅓ H.P. to 50 H.P.



### AIR COOLED CONDENSING UNIT

Self-contained, remote, truck type, from ¼ H.P. to 3 H.P.



### COMBINATION AIR AND WATER COOLED CONDENSING UNIT

Plenty of reserve capacity for extreme hot weather. Operates primarily as air cooled unit with shell and coil condenser as auxiliary in case of overload. From ⅓ H.P. to 3 H.P.

### COMPRESSOR UNITS

For use with evaporative condensers, low temperature cooling, processing and air conditioning installations, from 3 H.P. to 50 H.P.

**SEE this New CURTIS line at the International Heating and Ventilating Exposition—**

INTERNATIONAL AMPHITHEATRE
Chicago, Illinois
January 25-30, 1953
BOOTHS. 234, 236, 238, 335, 337, 339

***For Immediate Information*—Use This Coupon**

CURTIS REFRIGERATING MACHINE DIVISION 728
of Curtis Manufacturing Company
1999 KIENLEN AVENUE, ST. LOUIS 20, MISSOURI
I am interested in direct factory franchise. Send complete details.

COMPANY NAME_____

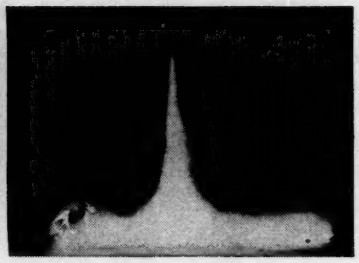
STREET_____

CITY_____ ZONE____ STATE_____

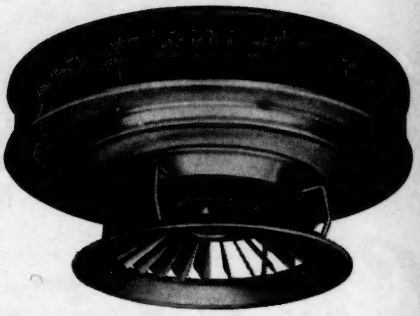
SIGNED_____

# See how TRANE Unit Heaters deliver heat where it's wanted...

*Throws heat without diffuser*



*With louver cone: 60% extra throw*

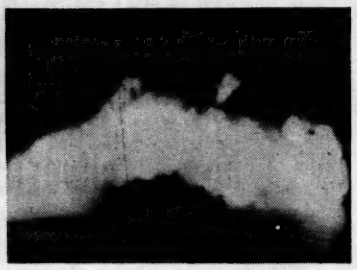


**Patented Louver Cone** on TRANE Projection Heater concentrates hot air stream for additional throw. Diffuses heat gently, directs it where needed, pinpoints cold spots—all with finger tip control. It taps waste ceiling heat, projects it down to floor line. Ideal for craneways, aisles, bays, and hundreds of other hard-to-heat places.

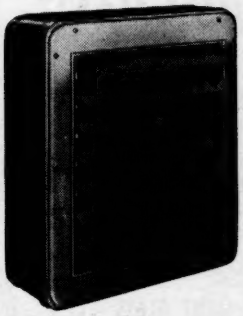
*Forces heat to wide area*

*"Spots" heat to one side*

*Diffuses heat in blanket*



*Split stream does double duty*



*Up to 25% more throw*

*Half flow ahead, half at angle*

**Patented Louver Fin Diffuser** gives new versatility to the TRANE Model H horizontal discharge unit heater. Countless diffusion patterns are now available—divided streams, gentle blanket, spot throw. TRANE also makes the Torridor, a blower unit for large volume heating; deluxe cabinet units and new, improved gas fired units. All in a complete range of capacities.

**TRANE Bucket and Float Traps**—Matched for perfect service with TRANE Unit Heaters; high or low pressure.

For complete information about how TRANE Unit Heaters and Diffusers can solve your heating problems, see your nearest TRANE sales office or write TRANE, La Crosse, Wisconsin.

MANUFACTURING ENGINEERS OF HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT

TRANE

THE TRANE COMPANY, LA CROSSE, WIS.
Eastern Mfg. Division, Scranton, Pa.
Trane Company of Canada, Ltd., Toronto
Offices in 80 U.S. and 14 Canadian Cities

# JENKINS PRACTICAL PIPING LAYOUTS 64

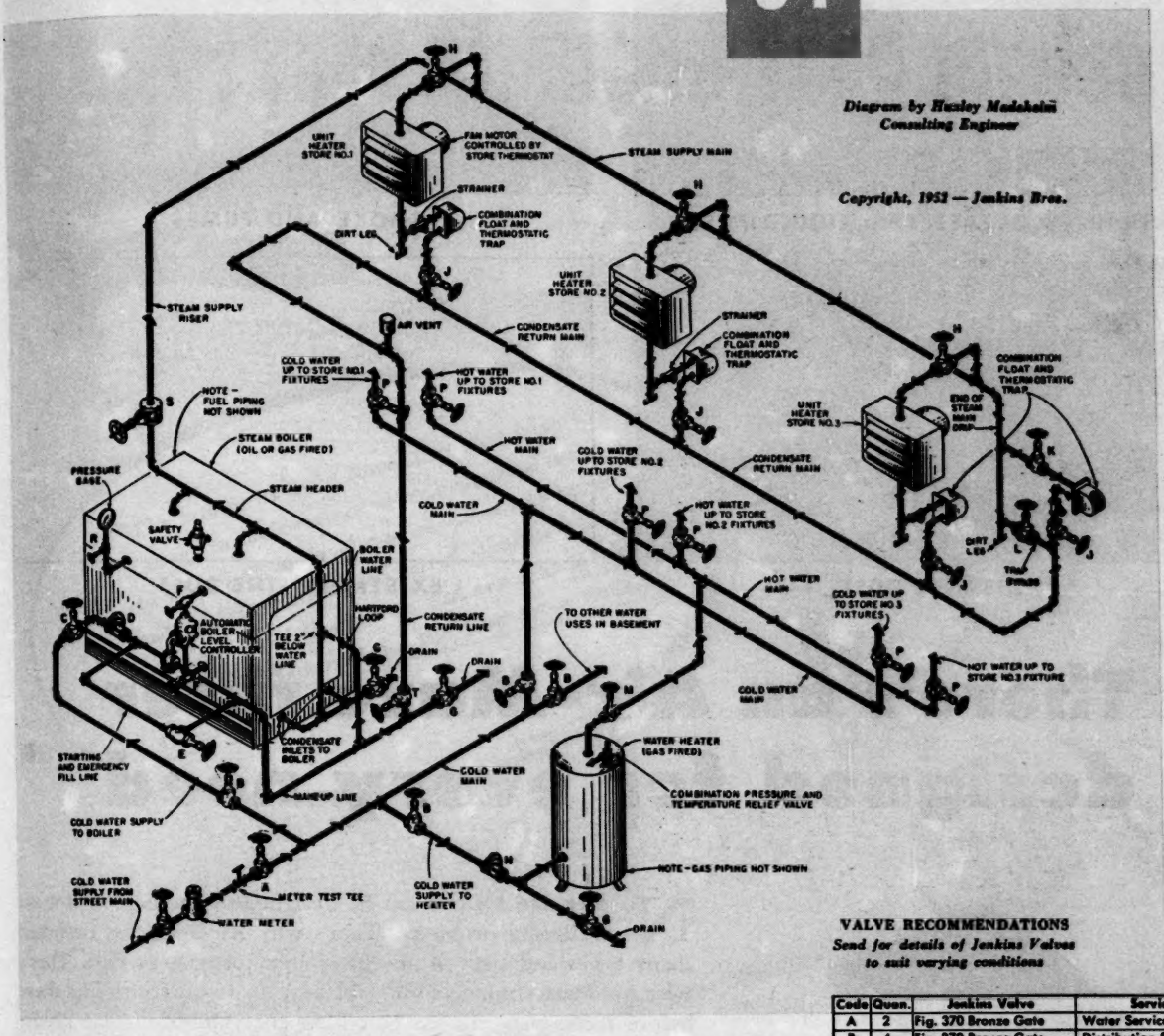

UNIT HEATER STORE NO.1
FAN MOTOR CONTROLLED BY STORE THERMOSTAT
STEAM SUPPLY MAIN
STRAINER
COMBINATION FLOAT AND THERMOSTATIC TRAP
DIRT LEG
UNIT HEATER STORE NO.2
STEAM SUPPLY RISER
AIR VENT
CONDENSATE RETURN MAIN
COLD WATER UP TO STORE NO.1 FIXTURES
HOT WATER UP TO STORE NO.1 FIXTURES
NOTE - FUEL PIPING NOT SHOWN
STEAM BOILER (OIL OR GAS FIRED)
HOT WATER MAIN
COLD WATER UP TO STORE NO.2 FIXTURES
UNIT HEATER STORE NO.3
END OF STEAM MAIN DRIP
PRESSURE GAGE
STEAM HEADER
HOT WATER UP TO STORE NO.2 FIXTURES
SAFETY VALVE
COLD WATER MAIN
BOILER WATER LINE
HARTFORD LOOP
CONDENSATE RETURN LINE
TO OTHER WATER USES IN BASEMENT
AUTOMATIC BOILER LEVEL CONTROLLER
TEE 2" BELOW WATER LINE
DRAIN
HOT WATER MAIN
COLD WATER UP TO STORE NO.3 FIXTURES
HOT WATER UP TO STORE NO.3 FIXTURE
COLD WATER MAIN
CONDENSATE INLETS TO BOILER
WATER HEATER (GAS FIRED)
STARTING AND EMERGENCY FILL LINE
COLD WATER MAIN
COMBINATION PRESSURE AND TEMPERATURE RELIEF VALVE
MAKE-UP LINE
COLD WATER SUPPLY TO BOILER
NOTE - GAS PIPING NOT SHOWN
COLD WATER SUPPLY FROM STREET MAIN
METER TEST TEE
COLD WATER SUPPLY TO HEATER
WATER METER
DRAIN

*Diagram by Huxley Madeheim Consulting Engineer*

*Copyright, 1952 — Jenkins Bros.*

**VALVE RECOMMENDATIONS**
*Send for details of Jenkins Valves to suit varying conditions*

| Code | Quan. | Jenkins Valve | Service |
|---|---|---|---|
| A | 2 | Fig. 370 Bronze Gate | Water Service Shutoff |
| B | 4 | Fig. 370 Bronze Gate | Distribution Shutoff |
| C | 1 | Fig. 106-A Bronze Globe | Water Supply to Boiler |
| D | 1 | Fig. 92 Bronze Swing Check | Prevent Boiler Backflow |
| E | 1 | Fig. 108-A Bronze Angle | Emergency Boiler Fill |
| F | 2 | Fig. 108-A Bronze Angle | Level Controller Shutoff |
| G | 3 | Fig. 106-A Bronze Globe | Drains Shutoff |
| H | 3 | Fig. 106-A Bronze Globe | Steam Supply to Heaters |
| J | 4 | Fig. 370 Bronze Gate | Condensate Drain Shutoffs |
| K | 1 | Fig. 106-A Bronze Globe | Steam Main Trap Connection |
| L | 1 | Fig. 106-A Bronze Globe | Trap Bypass |
| M | 1 | Fig. 47-U Bronze Gate | Hot Water Heater Shutoff |
| N | 1 | Fig. 92 Bronze Swing Check | Prevent Water Heater Backflow |
| P | 6 | Fig. 370 Bronze Gate | Water Supply Shutoffs |
| R | 1 | Fig. 743-G Bronze Needle | Pressure Gage Control |
| S | 1 | Fig. 651 I.B.B.M. Gate | Steam Main Shutoff |
| T | 1 | Fig. 370 Bronze Gate | Return Shutoff |

## *How to plan* PLUMBING AND HEATING IN A SMALL TAXPAYER BUILDING

**The one-story "taxpayer" building** developed with the movement of shopping centers to suburban areas. Constructed with or without a basement, it houses retail stores, service establishments, amusement centers, restaurants and offices.

**Heating and plumbing** requirements of such a building are usually provided by the owner, whose main interest is economy and trouble-free operation. An oil or gas fired steam boiler with automatic controls, and a separate gas fired heater for hot water supply, as illustrated, is commonly used.

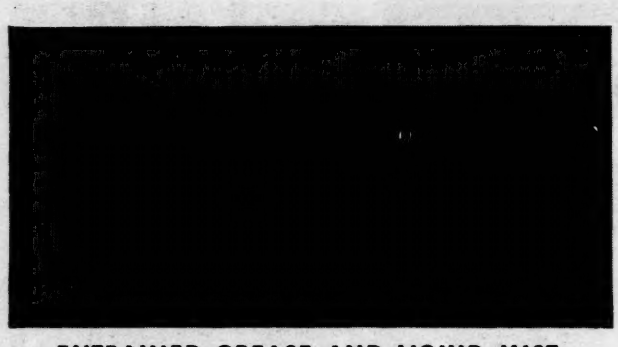
**The two-pipe heating system,** located in the basement, utilizes unit heaters hung from the ceiling to save space. Individual thermostatic controls assure fuel savings and even heating. A further refinement of the control system would include an automatic shutoff or modulator valve on the steam line just ahead of each heater, and an aquastat in the condensate return line from each heater. Piping is simple in such an installation and standard-type valves are used.

**Consultation** with accredited piping engineers and contractors is recommended when planning any major piping installation.

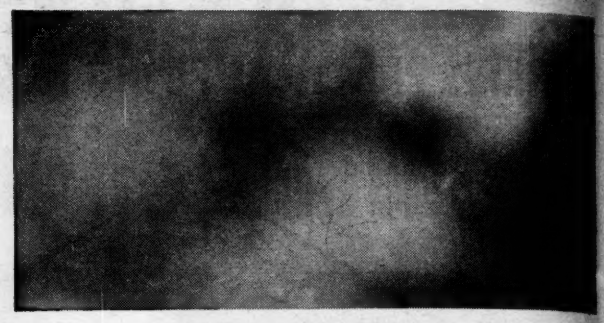
To save time, to simplify planning, to get all the advantages of Jenkins specialized valve engineering experience, select all the valves you need from the complete Jenkins line. It's your best assurance of *lowest cost in the long run.* Jenkins Bros., 100 Park Ave., New York 17.

**Complete description** and enlarged diagram of this layout free on request. Includes additional detailed information. Simply ask for Piping Layout No. 64.

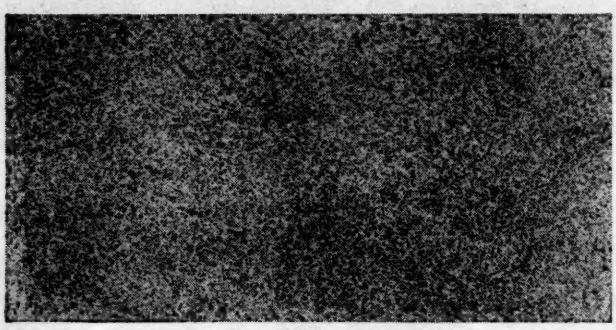
JENKINS VALVES
LOOK FOR THE DIAMOND MARK
SINCE 1864
Jenkins Bros



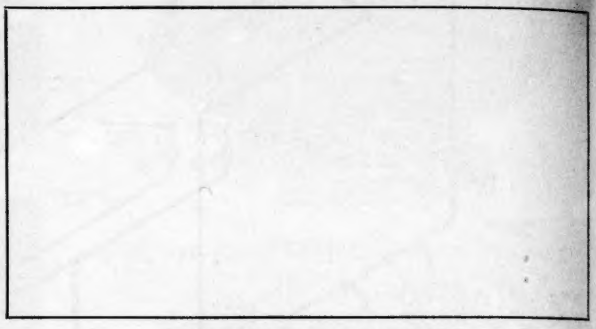
ENTRAINED GREASE AND LIQUID MIST



SMOKE AND FUMES

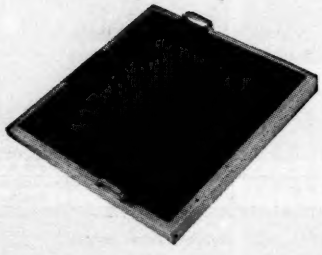


NUISANCE DUST

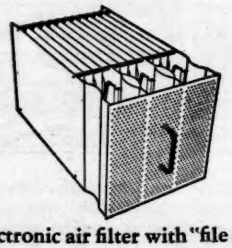


EXTREMELY FINE DUST

# There's an Air-Maze filter designed for every need



Viscous impingement air filter panels available in all-metal or disposable types.



Electromaze electronic air filter with "file drawer" design.

NO *ONE* AIR FILTER can be designed as the cure-all for *all* ventilating problems. That's why Air-Maze has designed many types and sizes of air filters—not just one or two. That's why Air-Maze engineers want the answers to questions like these before recommending the best filter for your particular needs:

What's the size and character of the airborne particles to be filtered?
Is the dust concentration light, heavy or average?
What's the air velocity?
What filtering efficiency is required?
How often is servicing practical?
How much room do you have for the filter installation?

Knowing the answers to these questions, Air-Maze engineers can specify the type and size of Air-Maze filter that *best suits* your combination of conditions. They don't make your problem fit the filter—they've designed the filter to fit your problem.

To get the expert help you need in solving your air filtering problems, call your nearby Air-Maze representative or write Air-Maze Corporation, Cleveland 5, Ohio.

AIR FILTERS
SILENCERS
SPARK ARRESTERS

AIR-MAZE

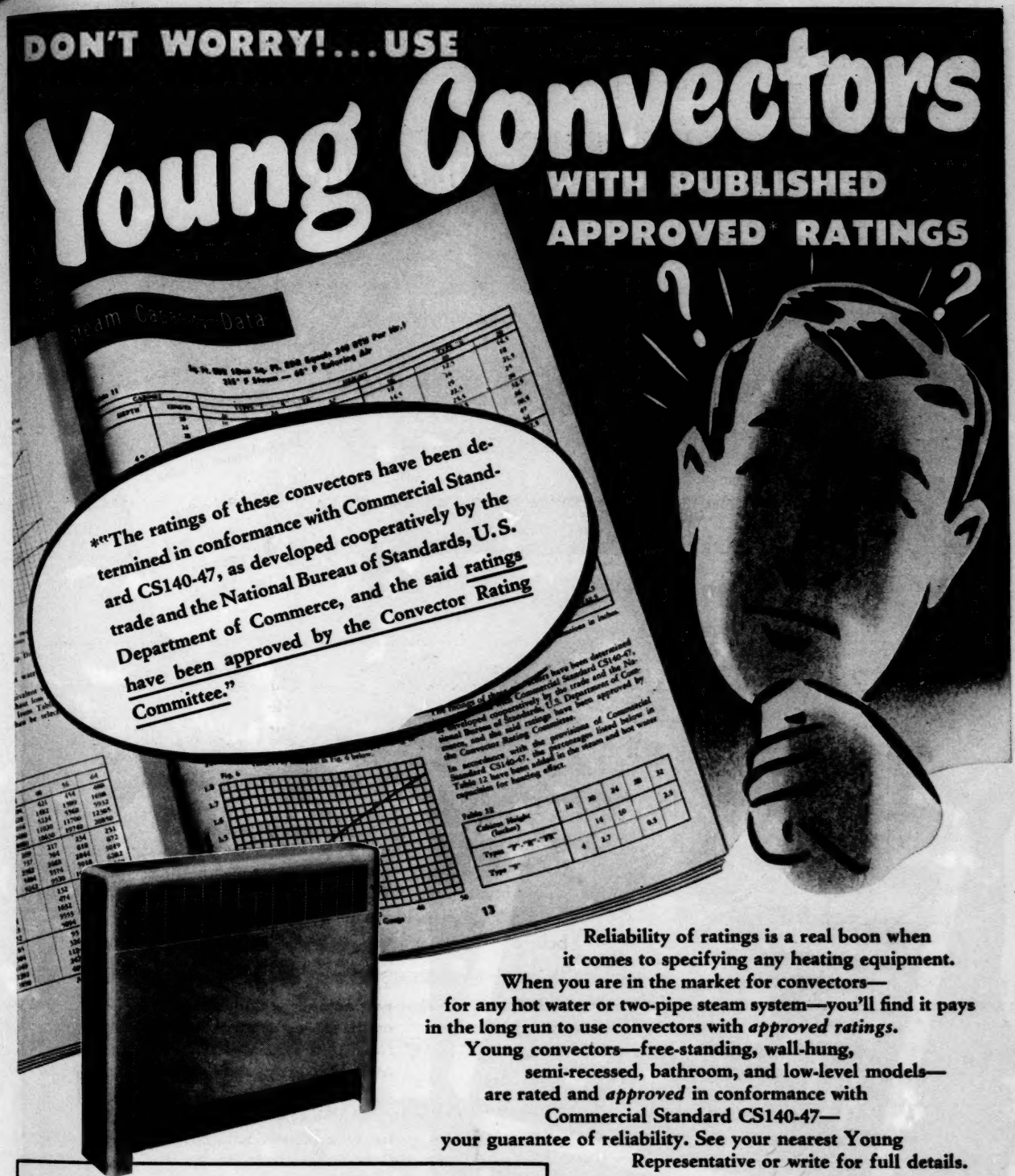
THE FILTER ENGINEERS

LIQUID FILTERS
OIL SEPARATORS
GREASE FILTERS

DON'T WORRY!...USE

# Young Convectors

## WITH PUBLISHED APPROVED RATINGS


*"The ratings of these convectors have been determined in conformance with Commercial Standard CS140-47, as developed cooperatively by the trade and the National Bureau of Standards, U.S. Department of Commerce, and the said ratings have been approved by the Convector Rating Committee."

Reliability of ratings is a real boon when it comes to specifying any heating equipment. When you are in the market for convectors—for any hot water or two-pipe steam system—you'll find it pays in the long run to use convectors with *approved ratings*. Young convectors—free-standing, wall-hung, semi-recessed, bathroom, and low-level models—are rated and *approved* in conformance with Commercial Standard CS140-47—your guarantee of reliability. See your nearest Young Representative or write for full details.

1927 • 1952
25 YEARS OF PROGRESS IN HEAT TRANSFER ENGINEERING

**YOUNG**

Heating, Cooling, Air Conditioning Products for Home and Industry.

Heat Transfer Products for Automotive and Industrial Applications.

**YOUNG RADIATOR COMPANY**

Dept. 522-M • RACINE, WISCONSIN

Factories at Racine, Wisconsin and Mattoon, Illinois

If you think all convectors are alike, you'll find Catalogs No. 4049 and 4150 revealing. They give full details, including illustrated features of Young Convectors, approved ratings, dimension data, etc. Be sure to have a copy in your catalog file. It will be sent you without obligation.

# 1952 TEMPERATURE CONTROL ALBUM

*the place*

*who was there*

Architects:
Lundeen and Hilfinger
Bloomington, Illinois

Heating Contractor:
American Foundry and
Furnace Company
Bloomington, Illinois

*what we did*

*notes of interest*

Our purpose in this new school was to provide a simple, low-cost, warm air panel heating and ventilating system. In this installation, the temperature in each room is individually controlled, and is kept constant by a Room Microtherm* and a proportioning type Control Motor on the mixing dampers in each room duct system. Air is distributed quietly and without drafts after passing through panel heating ducts in the floor. In each classroom, Barber-Colman UNI-FLO Air Distribution Outlets are set in the window ledges.

*Reg. U.S. Pat. Off.

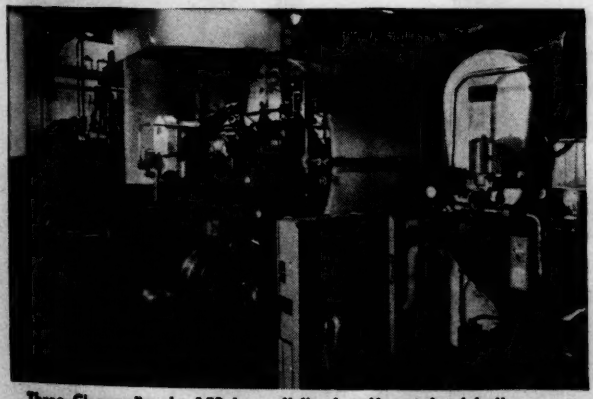
**BARBER-COLMAN COMPANY**
1224 ROCK STREET • ROCKFORD, ILLINOIS

BARBER COLMAN

In this modern newspaper building passersby can see running presses through 11 ft. plate glass windows, located directly behind flag pole in this picture.

**WASHINGTON POST BUILDING,** Washington, D. C. Albert Kahn Associated Architects and Engineers, Inc. John McShain, Inc. — General Contractor. Standard Engineering Company, Engineers and Contractors.

THE WASHINGTON POST'S new 7-story building is heated by a combination of a hot blast ventilating system for the inside areas and convector radiation along the outside walls. The steam distribution system is divided into two sections, one supplying the fan blast coils at 3 lbs. to 5 lbs. pressure and one supplying the radiation at 3 lbs. to 5 lbs. pressure.



Three Cleaver-Brooks 150 hp., oil-fired, self-contained boilers were easily and quickly installed in low headroom, basement space.

Three Cleaver-Brooks 150 hp. oil-fired, self-contained boilers, installed in the basement location, supply steam for the entire heating system.

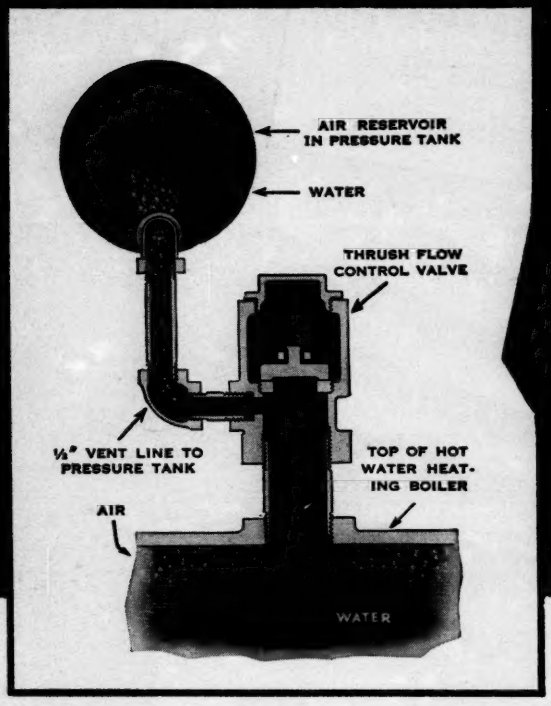
Modern Cleaver-Brooks boilers are increasingly specified for heating service. Completely self-contained and compact in design, requiring minimum headroom and floor area, Cleaver-Brooks boilers offer many installation and operating advantages — oil, gas, or combination oil and gas firing — fully automatic — clean — dependable performance — operate at a guaranteed efficiency of 80%. Available in sizes from 15 to 500 hp., 15 to 250 psi.

Write for the latest, fully illustrated Steam Boiler Catalog — Cleaver-Brooks Company, Dept. P-314 East Keefe Avenue, Milwaukee 12, Wisconsin, U.S.A. *Cable address*: CLEBRO-Milwaukeewis.

**Cleaver-Brooks**
Originators of Self-Contained
**STEAM BOILERS**

*Oil and Bitumen Tank-Car Heaters • Distillation Equipment • Oil and Gas-Fired Conversion Burners*

# AIR




# THRUSH
## FLOW CONTROL VALVES

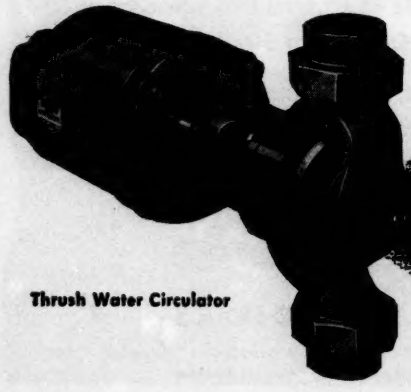
Angle Flow Control Valve

Vertical Flow Control Valve with air tube

Horizontal Valve for zoning

**HAVING TROUBLE** with air in hot water heating systems? Then you need Thrush Flow Control Valves with air tubes. Even a little air reduces efficiency of convectors, radiators or coils because of the limited volume of water in a modern hot water heating system. Air from the boiler passes up outside the air tube into the Thrush Flow Control Valve and is kept out of the system.

The Thrush Flow Control Valve is used with the Thrush Water Circulator to provide positive control of circulation and prevent overheating. Water is passed through the valve to the heating units only when heat is needed. Various types and sizes permit quick, low cost installation on any job. Ask your wholesaler about them today or write Department D-12.



Thrush Water Circulator

H. A. THRUSH & COMPANY
PERU • INDIANA

*Remember*—the trade marks "tt" and "TUBE-TURN" are applicable only to products of TUBE TURNS, INC.

## Engineered for extra strength

An important value you get with TUBE-TURN Welding Fittings and Flanges is extra strength . . . at no extra cost.

For example, this TUBE-TURN Welding Tee will withstand more pressure than required by standard codes . . . because it is drawn from seamless tubing to a barrel shape, and because of its generous crotch radius and thickness. Bursting pressures obtained in tests of representative fittings have averaged more than 25% higher than code requirements.

For this extra quality get in touch with your nearby TUBE TURNS' Distributor. You'll find one in every principal city.

Scrappy says: "Aid defense—more scrap today . . . more steel tomorrow."

Write Dept. B-12 for free booklet on Allowable Working Pressures. Use coupon on reverse side.

Be sure you see the double "tt."

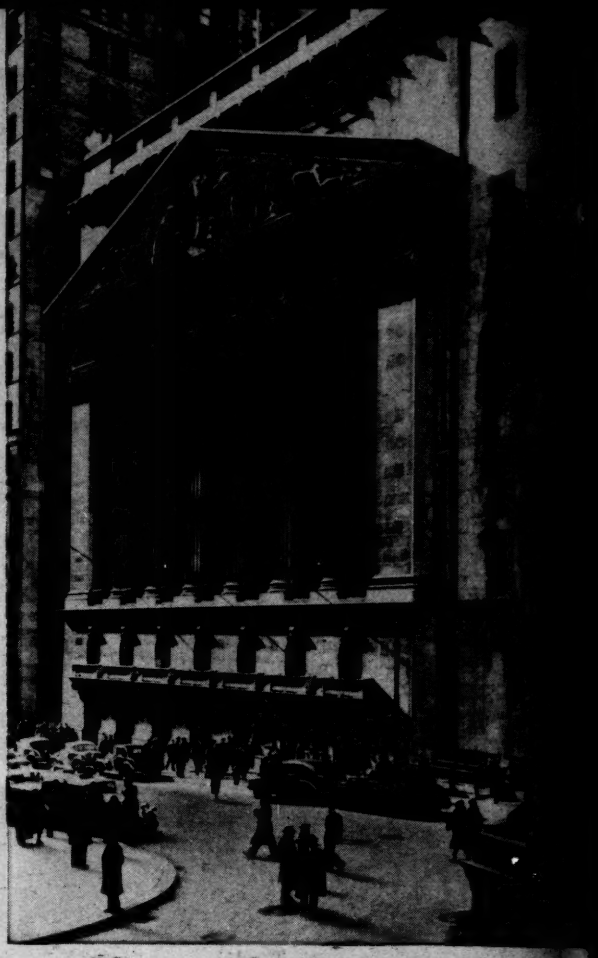
**TUBE TURNS, INC.** LOUISVILLE 1, KENTUCKY

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Chicago • Houston • Tulsa • San Francisco • Los Angeles
TUBE TURNS OF CANADA LIMITED, CHATHAM, ONTARIO . . . A wholly owned subsidiary of TUBE TURNS, INC.

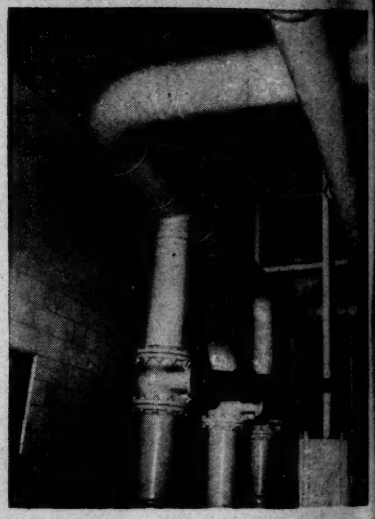
# Welded piping system serves New York Stock Exchange

Long the financial capital of the world, the New York Stock Exchange was one of the first commercial buildings to have controlled atmosphere. Recent additions provide efficient, modern air conditioning to keep the financial mart comfortable at all times.

New installations have been made with a minimum of fuss, in limited space, by use of compact welded piping systems. With TUBE-TURN Welding Fittings used to make directional changes, a permanently leakproof system is assured.



Use of welded piping simplified installation in cramped quarters. Welded lines can be fitted closely together, make a neat installation. Welders like to use TUBE-TURN Welding Fittings, because their consistent dimensional accuracy makes line-up easy, particularly important where space is at a premium.



These 10" and 14" lines carry condenser water to the building's cooling tower. Selection of TUBE-TURN Welding Fittings assures optimum flow conditions, and provides a permanently leakproof system.

**TUBE TURNS, INC., Dept. B-12**
224 East Broadway, Louisville 1, Kentucky

*Your name* _____

*Position* _____

*Company* _____

*Nature of business* _____

*Address* _____

*City* _____ *State* _____

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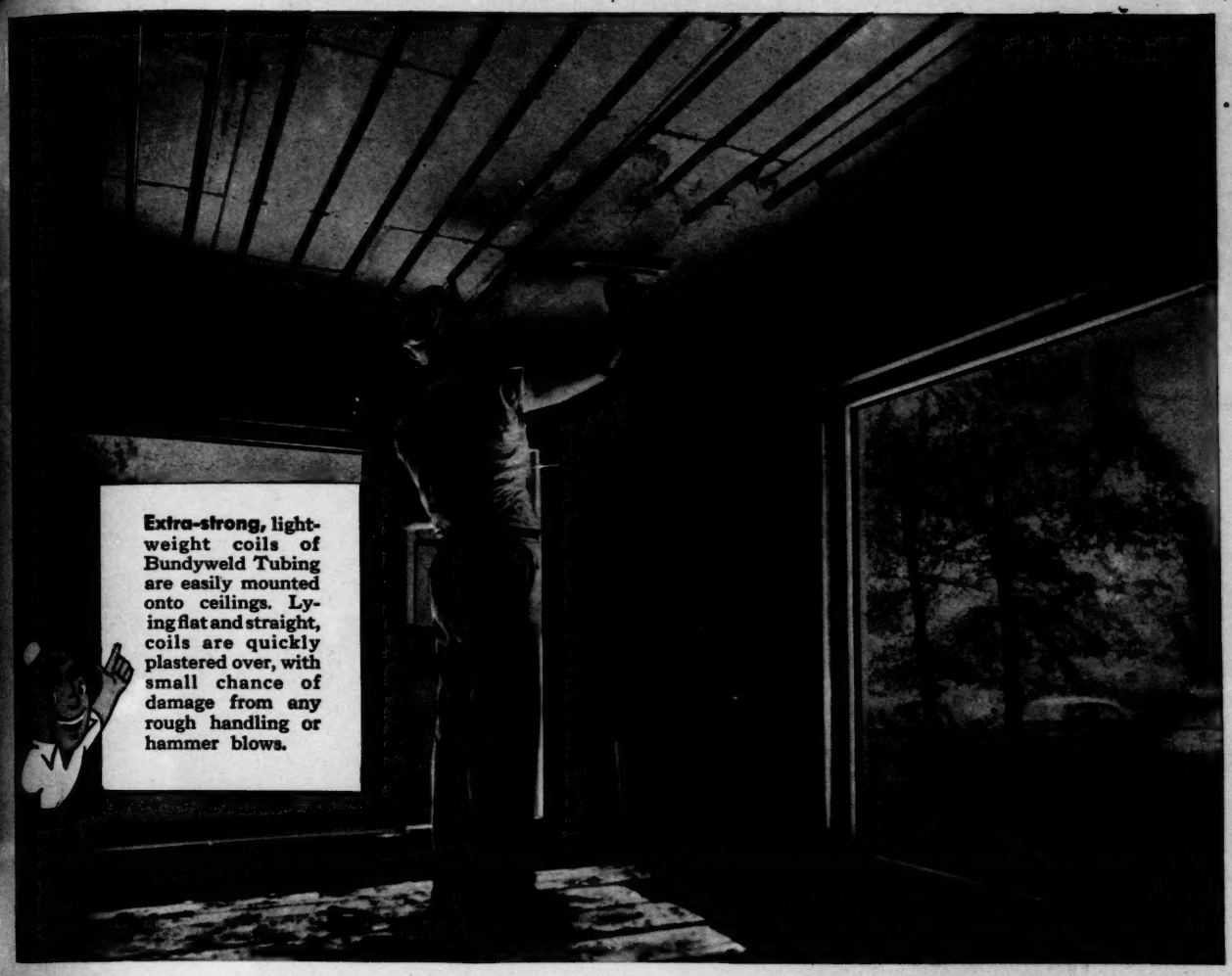
"tt" and "TUBE-TURN" Reg. U. S. Pat. Off.

**TUBE TURNS, INC.**
LOUISVILLE 1, KENTUCKY



**Extra-strong,** lightweight coils of Bundyweld Tubing are easily mounted onto ceilings. Lying flat and straight, coils are quickly plastered over, with small chance of damage from any rough handling or hammer blows.

### Key to Low Cost

Bundyweld is the only tubing double-walled from a single strip, copper-brazed through 360° of wall contact. It's leakproof, thinner walled, yet stronger. It transmits heat quickly, has high bursting strength. It saves on material costs and installation time.

Standard 20' or 24' lengths of Bundyweld are easily formed into coils in shop or on job site. Expanded ends (furnished when specified) are quickly soldered into leakproof union. Joined, lightweight coils are easily mounted onto ceiling, quickly plastered over.

# Now—leave competition 'way behind . . . with Bundyweld Ceiling Radiant Heating

**Now,** you can walk away from your closest competitors and keep your lead for years to come.

Take on the finest heating system of all . . . Bundyweld Ceiling Radiant Heating. It's so clean and even, so economical and convenient that it makes all other heating methods obsolete!

Chances are that your prospects have already heard about this wonderful new heating system. Enthusiastic users are spreading the good news among their friends. Millions are reading Bundy ads in *Better Homes & Gardens* and *American Home.* They're rushing coupons through the mail to request literature. They're writing for the names of builders and plumbing and heating contractors who handle Bundyweld Ceiling Radiant Heating *in their areas.*

Don't miss out on the most exciting new heating development on the market. Send coupon today for your free literature.

***Radiant Heating Division***
**BUNDY TUBING COMPANY**
***Detroit 14, Michigan***

***SEND FOR FREE LITERATURE!***

LIKE HAVING THE SUN IN YOUR CEILING

Bundyweld
Ceiling Radiant Heating

Radiant Heating Division, Dept. HV-1252
Bundy Tubing Company, Detroit 14, Mich.

☐ Send free 20-page nontechnical brochure explaining Bundyweld Ceiling Radiant Heating.
☐ Send Bundy technical radiant heating pamphlet.

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

# Who said only cucumbers are cool?



More and more of the country's foremost frozen food producers depend on Worthington refrigeration for the fast freezing which insures that fresh-picked flavor.

And more and more food outlets of every size protect produce . . . keep customers contented regardless of the weather . . . with Worthington air conditioning.

For any job—large or small—when you specify "Worthington" for air conditioning or refrigeration you specify the equipment your client links with the "first" names in every field.

No other manufacturer makes *so complete* a line. A Worthington system is all Worthington-*made*... not just Worthington-assembled . . . assuring perfectly balanced operation and unit responsibility.

Worthington Corporation, Air Conditioning and Refrigeration Division, Harrison, New Jersey.

A.2.10

**Visit us at the International Heating and Ventilating Exposition, Booth No. 824 in Chicago, January 26 to 30.**

# WORTHINGTON

AIR CONDITIONING AND REFRIGERATION

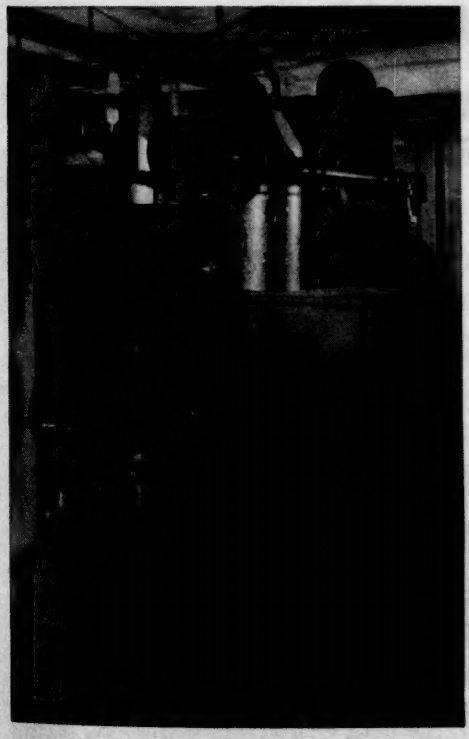
## SNOW MELTING A *PLUS* VALUE OF

# B & G *Hydro-Flo** Heating

● *The residence of E. E. Dohn, Syracuse Heating Supply, Inc., Syracuse, N.Y.*

● *Pipe coils for circulating hot water under driveway.*

● *Snow melts as fast as it falls on the heated driveway.*



*Boiler hook-up in the Dohn residence.*

Here's one more reason the B & G *Hydro-Flo* System is tops in modern heating. Hot water can be circulated by a B & G Booster Pump through pipe coils under driveways and sidewalks, melting snow as fast as it falls. Another back-breaking job eliminated . . . another strong selling point!

B & G *Hydro-Flo* Heating assures better, more economical *radiant* heating in buildings of every size and character. At every weather change, the system *automatically* varies the heat input, so that indoor temperature is uniformly comfortable. This close control of the heat supply obviously results in exceptional fuel economy.

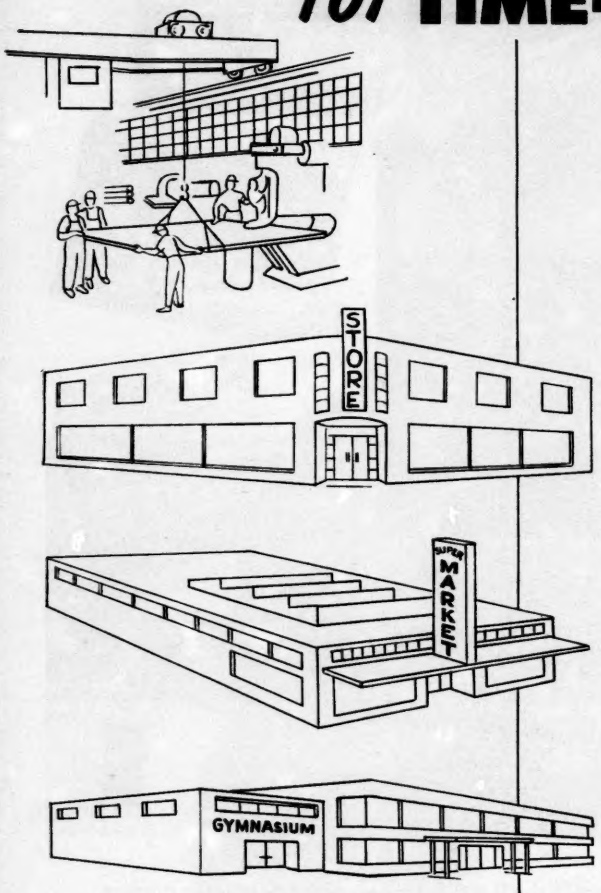
Add to all this the advantages of a limitless supply of domestic hot water . . . 24 hours a day, summer and winter.

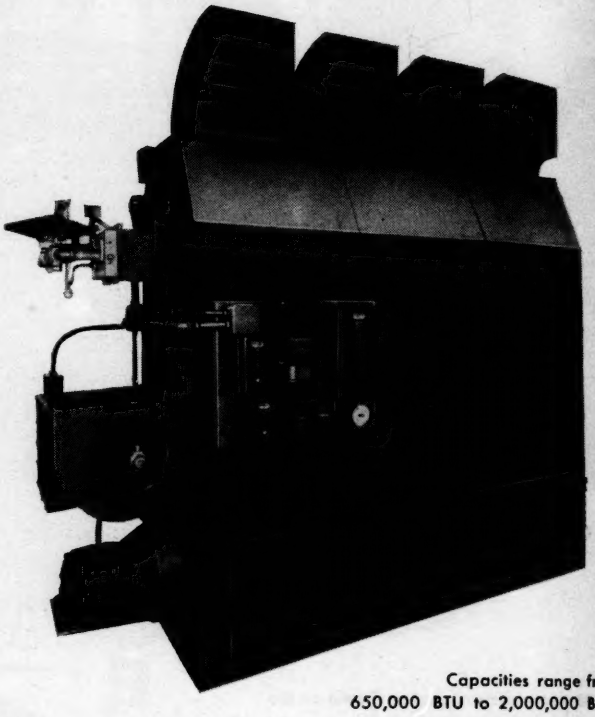
The photo at the left shows some of the B & G equipment used in the installation illustrated here. It includes B & G Booster Pumps, Flo Control Valves, ASME Relief Valve, Airtrol Tank and Boiler Fittings for eliminating air from the system and a Comfort Control System—a wind-compensating, indoor-outdoor temperature control.

**BELL & GOSSETT**
**COMPANY**
**Dept. CT-4, Morton Grove, Ill.**

*Canadian License: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto, Canada*
*Reg. U. S. Pat. Off.

# *Designed for* **LONG** *Time Satisfaction for* **TIME-SAVING** *Installation*



Capacities range from 650,000 BTU to 2,000,000 BTU.
*Underwriters' Laboratory Approved.

*Airtherm's*

**Complete, self-contained**

## DIRECT-FIRED HEATING SYSTEM

Easily installed — simply connect fuel, power and vent stack.

Air to be heated can be either recirculated, drawn in from the outside or a combination of both providing tempered make-up to balance exhaust systems.

Ideal summer ventilation, by simple adjustment of controls, provides a rapid movement of air throughout working zone for personnel comfort.

Compact unit can be placed wherever it is needed, floor mounted or suspended. Tested safety and operating controls assure reliable, automatic operation.

Fuel may be either gas or oil*, or combination gas and oil with burner for automatic changeover from one fuel to the other.

*Compare this flexibility*

**WRITE FOR YOUR FREE COPY OF CATALOG 802B**

Convectors | Horizontal Unit Heaters | Vertical Unit Heaters | Propeller Fan Unit Heaters

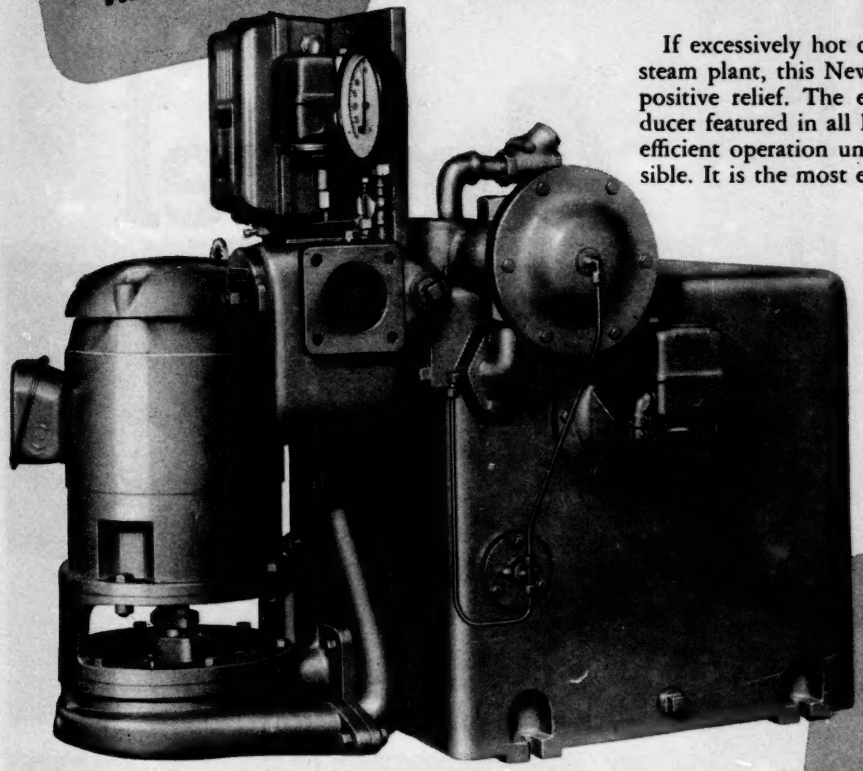
For Heating Satisfaction... Think First of *Airtherm*

**AIRTHERM MANUFACTURING COMPANY**
722 South Spring Avenue • St. Louis 10, Missouri

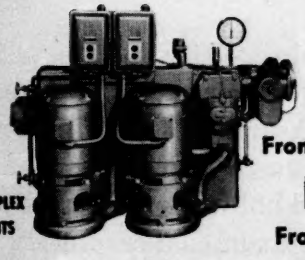
**NEW!**
**VERTICAL MOTOR HIGH ABOVE DIRT AND WATER**

# HOFFMAN
## VACUUM PUMPS

If excessively hot condensate is a problem in your steam plant, this New Hoffman Vacuum Pump offers positive relief. The exclusive Jet-Type Vacuum Producer featured in all Hoffman Vacuum Pumps assures efficient operation under conditions ordinarily impossible. It is the most effective means known for simultaneously removing air and water from the system. Years of service cause no deterioration, as the Hoffman Jet has no moving parts to wear or score. As a result, *the Hoffman Vacuum Pump will handle hotter water than other types of pumping units.*



TYPES "VS" and "VSS" SINGLE UNITS



DUPLEX UNITS

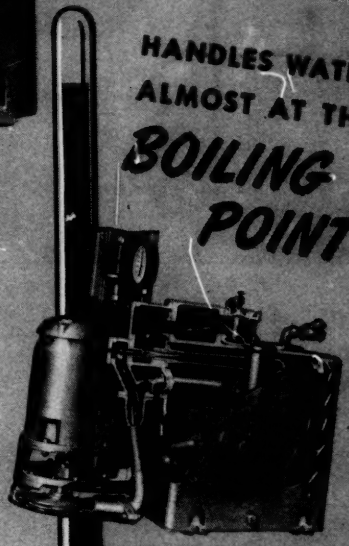
**CAPACITIES:**
From 2,500 to 100,000 sq. ft. EDR.

**DISCHARGE PRESSURES**
From 20 lbs. to 60 lbs. per sq. in.

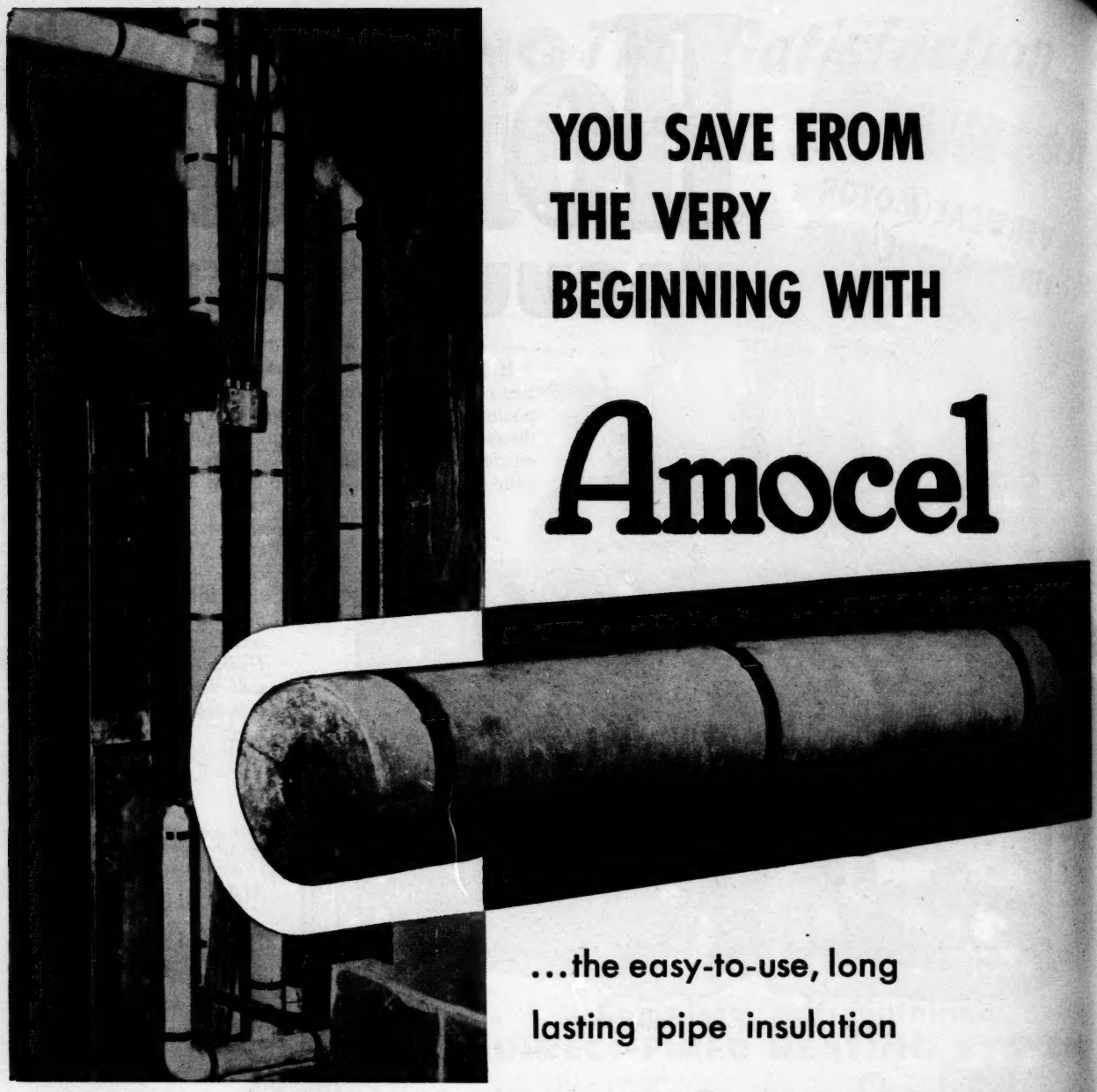
● Bronze fitted throughout ● Enclosed, precision balanced bronze impeller ● Renewable bronze wearing ring ● Split bronze packing gland ● Stainless steel impeller hub ● Impeller has top suction inlet—eliminates air or vapor binding ● Rigid motor support, very quiet ● Easily handles 200°F condensate.

*Write today for Cat. No. VP 852, no obligation.*

**HANDLES WATER ALMOST AT THE *BOILING POINT***



The Hoffman Jet is the most effective method for exhausting air and water . . . *at high temperatures.*



# YOU SAVE FROM THE VERY BEGINNING WITH

# Amocel

## ...the easy-to-use, long lasting pipe insulation

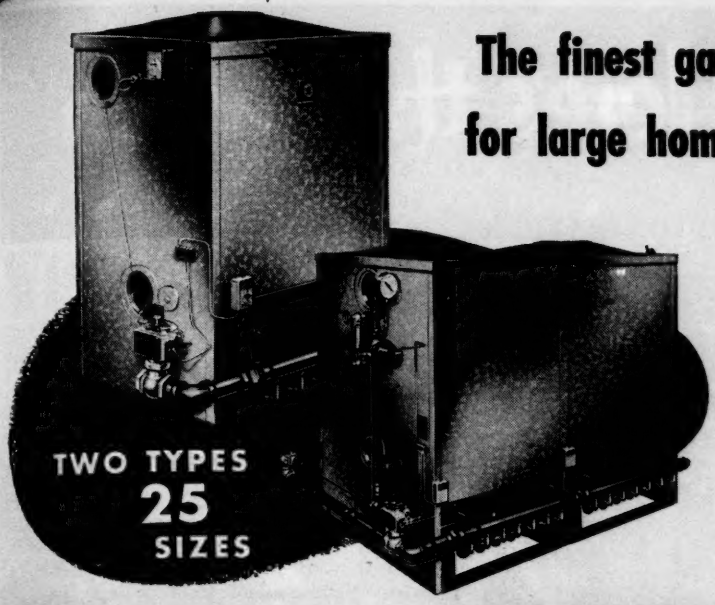
Probably no one will ever again need to see this installation of long-lasting Amocel, for "out of sight means out of mind" with this durable insulation. There's no concern about replacement, because Amocel lasts the life of the building, so steam and hot water lines need not be accessible for insulation maintenance. Amocel is Unarco's economical pipe insulation for all commercial uses up to 600°F. temperature. For higher temperatures—up to 1200°—specify Unarco Unibestos. Phone your nearby Unarco Distributor for information and from-stock deliveries. *Write for Bulletin 76-109.*

UNARCO

**UNION ASBESTOS & RUBBER COMPANY**

DEPT. B-12, 332 SOUTH MICHIGAN AVENUE • CHICAGO 4, ILLINOIS

# The finest gas boilers on the market for large homes and larger buildings!



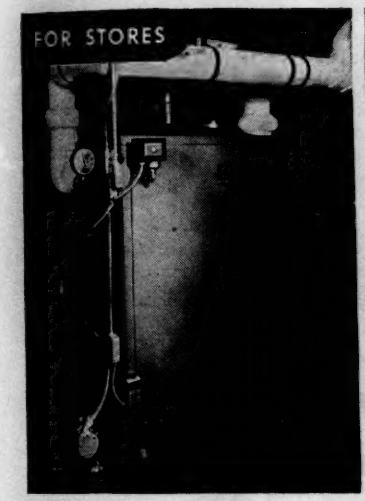

## STANDARD BOILERS

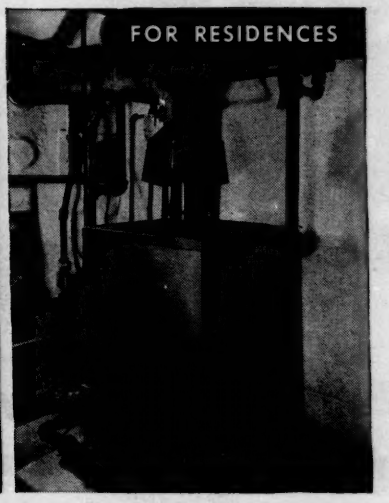
### by AMERICAN-Standard

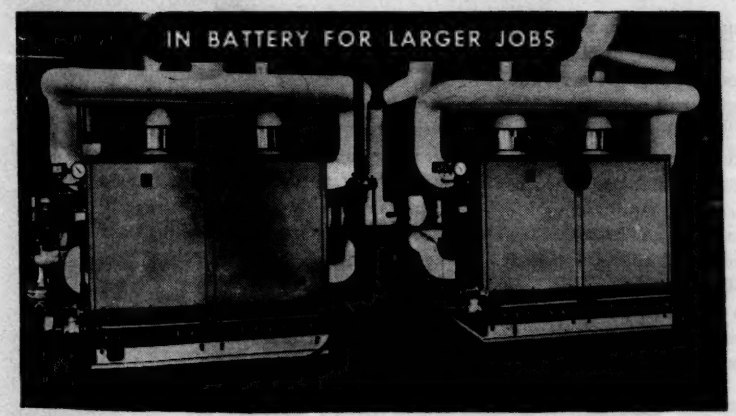
● Designed by experts in the field of gas heating, Standard boilers are outstanding examples of good engineering and manufacturing skill. Heating surfaces, burners, controls and other essential features are coordinated to assure maximum heat output with lowest operating and maintenance cost.

Made in two types—1-G and 4-G—and in twenty-five sizes, these top quality boilers provide effortless gas heating in large homes, apartment buildings, hospitals, and in various commercial and industrial buildings. Furthermore, they can be used in batteries in larger buildings to provide an extremely flexible heat source through the operation of one or more units, thus giving added economy in mild weather, as well as perfect comfort in the coldest weather.

Standard boilers and other gas fired heating equipment in the American-Standard line are sold through selected wholesale distributors to heating contractors. **American Radiator & Standard Sanitary Corporation,** P.O. Box 1226, Pittsburgh 30, Pa.



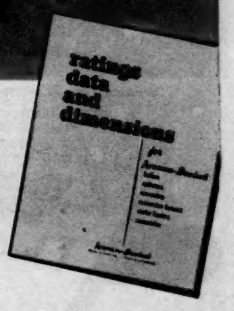




### Precision-machined and sub-assembled to facilitate quick and easy installation

Standard boilers have cast-iron sections which are precision-machined to facilitate quick and easy assembly. Individual sections may be conveniently carried through any ordinary doorway. To save further time and labor, controls, valves, and control piping are factory-assembled as far as possible.

NEW DATA BOOK
Now Available!




**A comprehensive, instructive manual to help you select and install any type of radiator heating equipment in the American-Standard line. Ask your wholesaler for your copy. Form No. 220.**

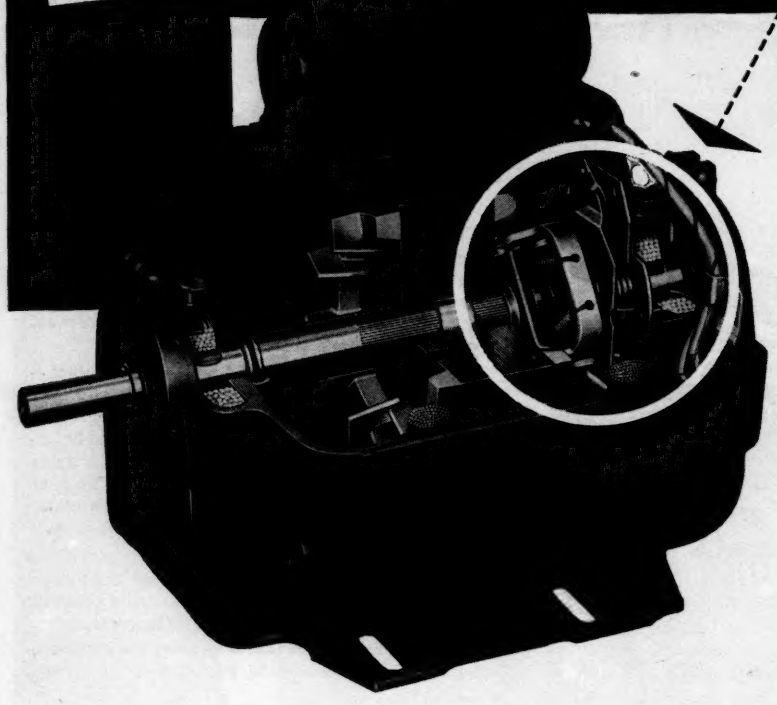
AMERICAN-Standard
HEATING

*Serving home and industry*

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

**Wagner**
**ELECTRIC MOTORS**
**...the choice of leaders in industry**

# Here's the switch

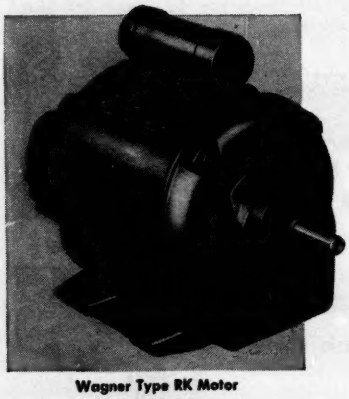


## that made 3,000,000 starts and stops

Wagner Type RK capacitor-start induction motors are equipped with a Wagner-made centrifugal switch that disconnects the starting winding and capacitor from the line when the motor approaches operating speed. One of these switches, from a ⅓ hp motor, made over three million starts and stops under test—more than the motor in service would make in 85 years if it started every fifteen minutes, day and night!

In most cases, the useful life of a capacitor-start motor is determined by the life of the switch. The long life of the Wagner switch is only one of many features that make Wagner Type RK Motors the *right* choice to power your product with assurance of long, troublefree operation.

## AND HERE'S THE MOTOR that fits your needs for applications requiring high starting torque



Wagner Type RK Motor
⅛ through 3 h. p.

Wagner capacitor-start induction motors are your best choice for applications where starting loads are fairly heavy, but which can be brought up to operating speed quickly. They have become increasingly popular for installation on equipment such as mechanical refrigerators, air conditioning equipment, domestic water pumps, motor-driven tools, coal stokers, and on similar fractional horsepower applications.

These motors offer low maintenance cost—only a minimum of servicing is required—and they give many years of reliable service with unusual freedom from vibration and noise.

* * *

When you standardize on Wagner Motors you get the advantages of a liberal warranty . . . of nationwide service facilities, with replacement motors and parts available from more than 650 Authorized Service Stations plus 25 Wagner-owned Service Branches. You can choose from a wide variety of types and sizes (from 1/125 to 400 hp). Bulletin MU-185 gives complete information—write for your copy.

®Wagner Electric Corporation
EST. WE 1891

**WAGNER ELECTRIC CORPORATION**
**6463 Plymouth Ave., St. Louis 14, Mo., U.S.A.**

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

**BRANCHES IN 32 PRINCIPAL CITIES**

# these steam traps won't freeze up!

Freeze-ups of outdoor steam traps in winter weather often cause production delays. Don't take that chance . . . especially when it's so easy to install Yarways, the steam traps that *won't freeze up.*

They won't freeze because condensate does not accumulate. The only moving part—a little valve—is continually testing for condensate, discharging it as soon as it forms. There's never anything to freeze.

Other reasons why over 750,000 Yarway Impulse Steam Traps have been sold—they get equipment hotter, sooner; light weight; small size; easy to install and maintain; good for all pressures; made of stainless steel.

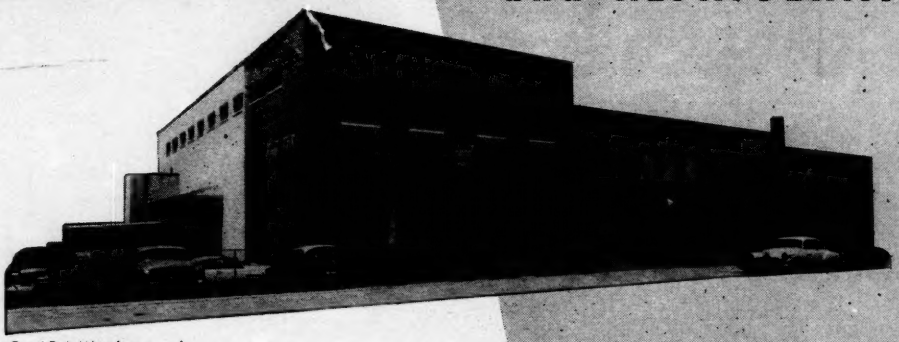
More than 200 industrial distributors sell Yarway Traps and Strainers. See your nearest one today. For name, and free 24-page Steam Trap Book, write . . .

**YARNALL-WARING COMPANY**
104 Mermaid Ave., Philadelphia 18, Pa.

**the steam trap designed with more production in mind**

# FOOD FAIR *Selects*

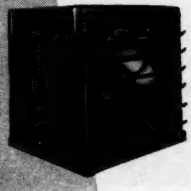
## Marlo AIR CONDITIONING and REFRIGERATION



New Food Fair Warehouse and Office in Washington, D. C. Architect: Leon Chatelain; Air Conditioning Contractor: Washington Refrigeration Co.

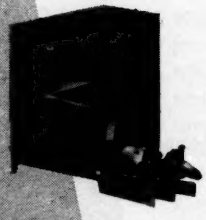
## . . . to protect meat and produce!

## . . . to keep office workers comfortable!

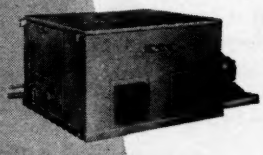


For food refrigeration that keeps meats and produce fresh (and profitable) . . . Marlo gravity-type cooling coils and DUC pull-through unit coolers were used.

From meat and produce coolers to the spacious offices, this modern new Food Fair Warehouse and Office building depends on Marlo quality for its air conditioning and refrigeration needs.



A quiet Marlo Cooling Tower (installed out-of-sight) serves all air conditioning and refrigeration needs . . . with *maximum* water savings.



For perfect year 'round comfort . . . Marlo ceiling type air conditioning units were installed (with complete control over summer-winter comfort needs).

**Marlo COIL COMPANY**

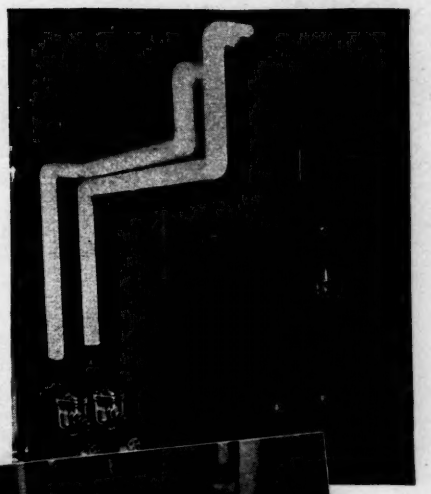
*Manufacturers of* COOLING TOWERS • EVAPORATIVE CONDENSERS • INDUSTRIAL COOLERS • AIR CONDITIONING UNITS • MULTI-ZONE UNITS • BLAST HEATING & COOLING COILS

**Saint Louis 10, Missouri**

# What's new?

## A new host in Detroit!

From an advertisement by Sheraton Corporation of America.



1 Sarco Inverted Bucket Steam Traps as installed on "High Speed" tumbler driers.

2 Sarco Inverted Bucket Steam Traps on presses.

3 Sarco Float-Thermostatic Steam Traps are installed on the multi-roll ironers. Traps are not visible.

THE "BOOK-CADILLAC" HOTEL famous to millions who visit the world's automotive headquarters, has now joined the Sheraton family and is known as the SHERATON-CADILLAC.

Upon acquiring the hotel, the Sheraton Corporation of America proceeded to spend a million and a half dollars in a most thoroughgoing renovation—from subcellars to roof.

An important part of this project was complete modernization of the extensive laundry. Every piece of steam heated equipment is now fitted with

**Sarco Steam Traps**

of the type best suited to each application.

An immediate result reported by the hotel's Engineering Department is:

**"Steam Consumption in Laundry reduced by 32.8%"**

That is a very substantial saving in steam dollars, which will go far towards paying for improvements made in the laundry.

Would you like to make similar savings?

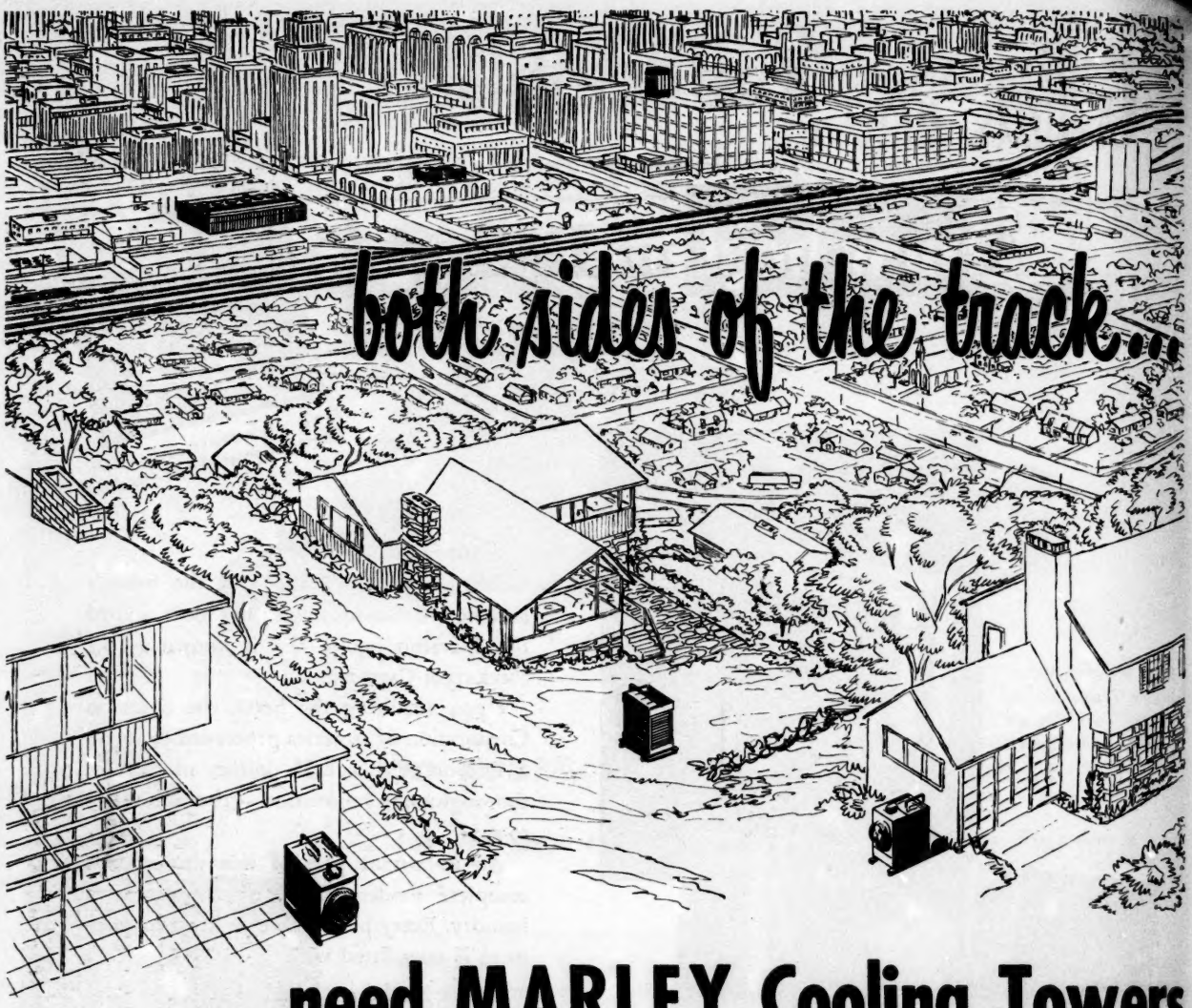
Be right the first time—see Sarco first. Write for Bulletin 145-2: "Selecting the Right Type of Steam Trap."

**SARCO COMPANY, INC.**
Empire State Bldg., New York 1, N.Y.
Sarco Canada Ltd., Toronto 8, Ontario
REPRESENTED IN PRINCIPAL CITIES

**SARCO**

sarco quality assures satisfaction

428




# ...need MARLEY Cooling Towers

Marley Aquatower, world's most popular mechanical draft cooling tower for residence air conditioning.

Everyone who sells or installs cooling towers is aware of the market for commercial and industrial towers and of Marley's dominance in the field.

Not so obvious but equally important is the rapid growth of a new market for Marley cooling towers over on the residential side of the tracks. Recent developments in home air conditioning have given this market a tremendous impetus. Thousands of Marley cooling towers have been installed in residential areas — and of greater interest to you are the multiplied thousands of Marley towers that will be installed in the coming season.

Now's the time to lay plans to capture your share of this skyrocketing market. Make a survey of the potential in your city, and analyze the various small towers available. You'll find that "backyard business" has become *big* business — and that Marley offers the line that is most complete, easiest to sell and install, surest to satisfy your customers.

MARLEY

**The Marley Company**

Kansas City 5, Missouri

# TRI-FLEX and AEROVANE REGISTERS

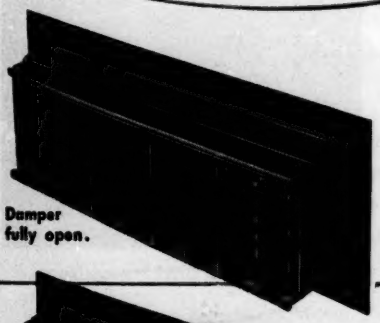
## now equipped with

# Opposed Blade Dampers

Showing TRI-FLEX T-647 Double Deflection Register with Opposed Blade Damper

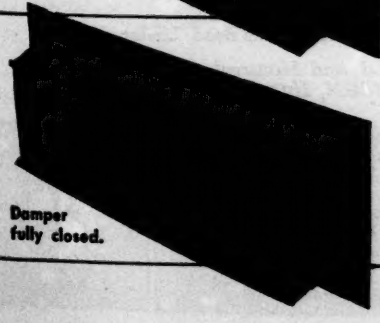
**KEY OPERATOR FOR OPPOSED BLADE DAMPER**

Blades are regulated by key operator which may be removed or tapped permanently into place.



Damper fully open.

Damper partially open.



Damper fully closed.

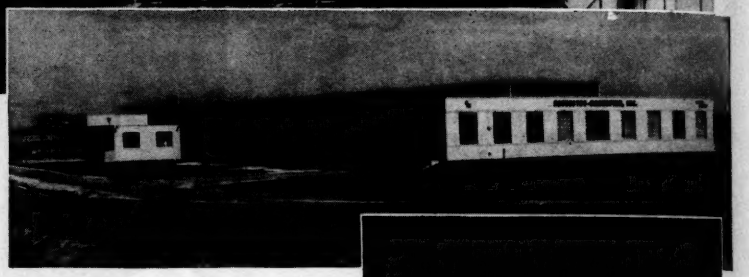
**TRI-FLEX** Supply Air Registers and AEROVANE Return Air Registers — specified and installed on important air conditioning jobs — are now constructed with opposed blade dampers.

This improved damper unit insures uniform distribution of air over the entire face of the register . . . and provides positive damper setting in any position from fully open to fully closed regardless of system pressure. Set in a rigid steel frame, blades are formed for extra strength and stiffness, and overlap when closed, eliminating any possibility of air leakage. Blades are regulated through the face of the register by means of a key operator which may be removed or tapped permanently into place.

*For complete information and size selection-data for TRI-FLEX and AEROVANE Registers and Grilles, write for a copy of Catalog No. 200.*

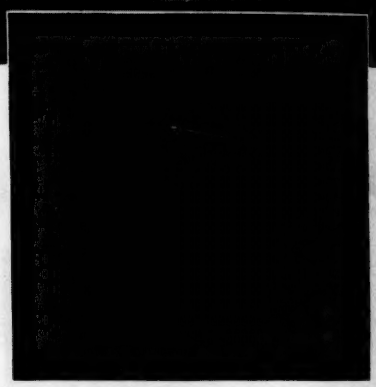
TUTTLE & BAILEY INC

NEW BRITAIN, CONNECTICUT



# This modern plant is heated with modern REVOLVING Unit Heaters

The Crawfordsville, Indiana plant of Raybestos-Manhattan, Inc., one of the country's leading manufacturers of asbestos and rubber products is an example of a modern carefully planned industrial building, laid out for highest efficiency in manufacturing. Typical of the equipment selected with this end in view are the Wing Revolving Unit Heaters. These heaters, by distributing the heated air downwards in a constantly changing direction, keep the workers comfortably warm and invigorated, without subjecting them to constant blasts of hot air or chilly drafts. Wing Revolving Unit Heaters are worth a great deal from the standpoint of employee relations alone.



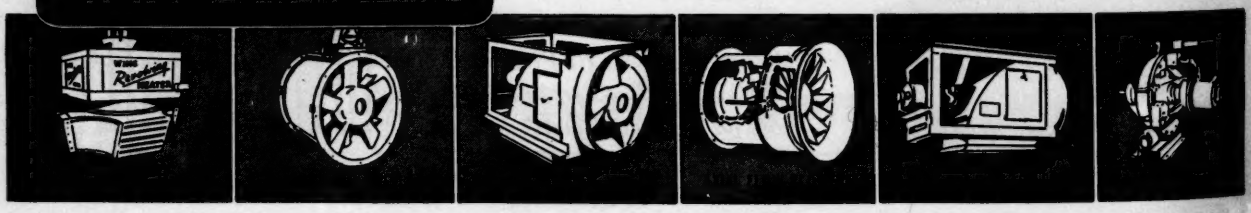
*The discharge outlets of the Wing Revolving Unit Heaters revolve slowly, distributing the heated air downwards in gently moving streams, that can be adjusted for different shapes of areas to be covered. In the summer time, with the heat turned off they act as a perfect air cooling system.*

**Wing**

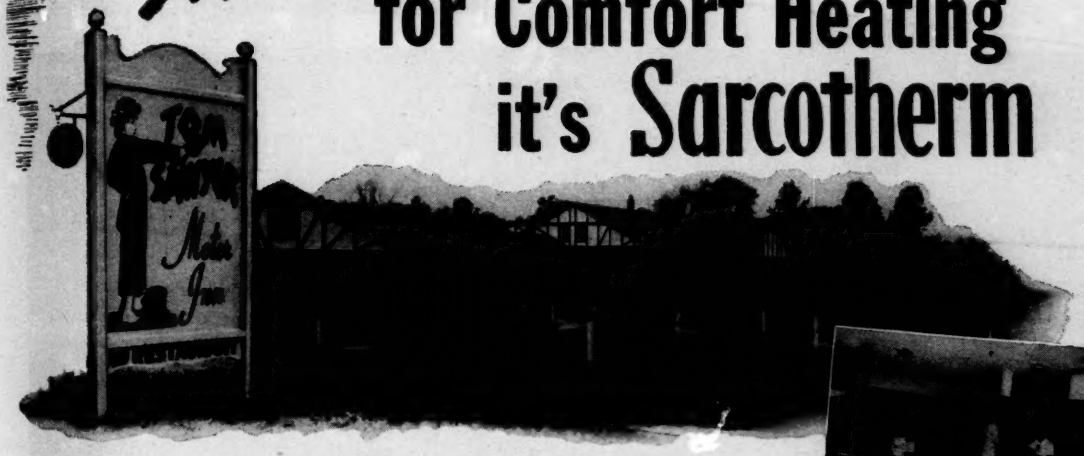
REVOLVING UNIT HEATERS

**L. J. Wing Mfg. Co.** 158 Vreeland Mills Road, Linden, N.J.

*Factories, Linden, N.J. and Montreal, Canada*
*In Europe: Establissements WANSON, Haren-Nord, Brussels, Belgium*



# In Motor Courts too!
# for Comfort Heating it's Sarcotherm




Tom Sawyer Motor Inn, Albany, N. Y., 100 rooms with 100 baths. Highly rated by A.A.A. . . . Radiant Heating System designed by LeValley-McLeod, Inc. of Schenectady, and installed by A. J. Eckert Co., Albany, N. Y. . . . includes 5 zones—completely Sarcotherm equipped.

Today the luxurious motels which are rapidly displacing the old overnight cabins along our highways from coast to coast, include central heat among the hotel comforts offered.

Heating of the one-story, spread-out buildings is usually by forced hot water or radiant means, for which

**SARCOTHERM**

weather-compensated temperature control with continuous circulation is unequalled.

We have pioneered in this field and our experience is at the disposal of architects and engineers who are designing motor courts and wish to include the latest in automatic heating. Here are a few of the Motels recently equipped with Sarcotherm Controls:

Newberry Motel, Russelville, Ky.
Miami Courts Tourist Cabins, Salisbury, Md.
Hotel Sleep, Rahway, N. J.
Garden Motor Lodge, Troy Hills, N. J.
Dutch Maid Motor Lodge No. 2, Woodbridge, N. J.
Smith's Tourist Court, R.F.D., Lynchburg, Va.
Van Winkle Motel, Everett, Washington
Snyder's Court, North Bend, Washington
Leonard Auto Court, Parkland, Washington

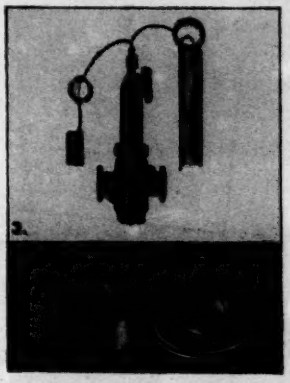
•

**SARCOTHERM CONTROLS, INC.**

Empire State Bldg., New York 1, N. Y. • Represented in principal cities

A SARCO PRODUCT

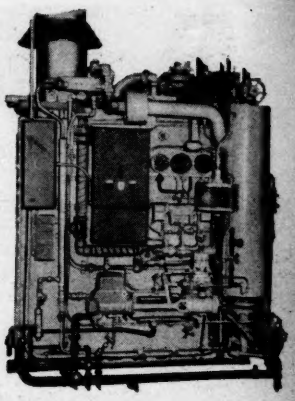
1. Main Lobby and Registration Desk at Tom Sawyer Motor Inn.
2. Friends meet at the main entrance in the atmosphere of an exclusive country club.



3. The heart of the Sarcotherm control system for radiant or forced hot water heating is this unique control valve. It is actuated by liquid expansion thermostats, one located outside the building and one in the valve itself. Between them they anticipate changes in heat loss ratio, thus maintaining comfort temperatures under all conditions.
4. The Sarcotherm Comfort Control "Thermoray" is an extremely sensitive thermostat affected by both radiation and convection.

23

The C-E Re-Circulation Steam Generator. Available in capacities up to 6,000 pounds of steam per hour, yet fits into a space less than seven feet square by eight feet high.



THE LAWRENCE PAPER COMPANY
LAWRENCE, KANSAS

OFFICE OF THE VICE PRESIDENT

September 29, 1952

Combustion Engineering Superheater, Inc.
1461 Board of Trade Building
Kansas City, Missouri

Attn: W. J. Clemens, Sales Engineer

Gentlemen:

Last February, we installed one of your C-E re-circulation steam generators in our plant.

This generator, rated at 6,000# of steam per hour at 200 Psi, serves our 76-inch corrugator. In spite of the wide fluctuations in amount of steam used due to the frequent starting and stopping of the machine, this generator has handled our steam load with ease.

One of the nicest features of the generator is the quickness with which it can be gotten into operation. In order to get started at 7:00 o'clock, we used to leave the steam on our corrugator all night but since the installation of this machine, one of the mechanics can start it in four or five minutes and have the machine heated up in less than half an hour.

The machine is so simple in operation that it is easy for one of the operators on the corrugator to look after it as well as tend to his duties on the corrugating machine.

We also find that we can vary the steam pressure for different types of orders and make a saving that was impossible to us with our old boiler set-up.

Although this equipment has only been in our plant eight months, we do not hesitate to recommend it as it has given us such fine service.

Yours very truly,

Justin D. Hill

Justin D. Hill,
Vice President

## *Mr. Hill says:*
### *his C-E Re-circulation Steam Generator...*

- Meets wide fluctuations in amount of steam used...
- Is adaptable to frequent starting and stopping...
- Handles steam load with ease...
- Can be started up in four or five minutes...
- Is simple in operation...
- Can be used for varying steam pressures...
- Makes a saving that was impossible with old boiler set-up...

**...and Mr. Hill sums up these advantages by saying—**

# "We do not hesitate to recommend it as it has given us such fine service"

**COMBUSTION ENGINEERING—SUPERHEATER, INC.**

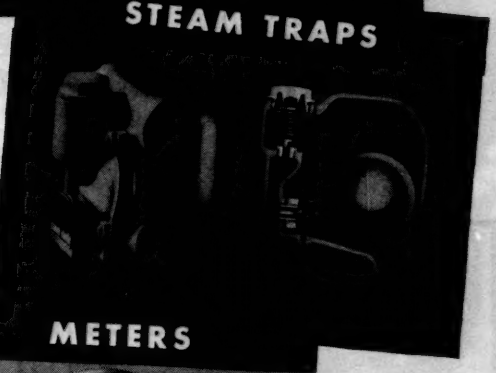
Combustion Engineering Building
200 Madison Avenue, New York 16, N. Y.

C-E

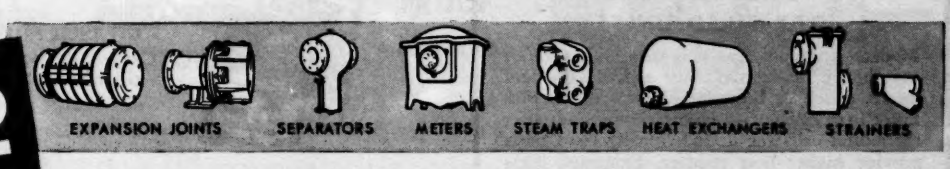
B-629

ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

# ADSCO Y-TYPE STRAINERS



Protect regulators, pumps, valves, and traps with ADSCO Y-type Strainers. They remove dirt, scale, and other foreign matter from steam, gas, air, water, and oil lines... before the dirt reaches equipment. Maintenance thus is reduced and costly shutdowns prevented. Screens in ADSCO Y-type Strainers have free opening area 2 to 8 times greater than inside area of pipe. The gasketed cap and tapered fit for screens guarantee a uniform, snug fit. Pressure drop through strainers is no greater than an ordinary elbow. Write for Bulletin 46-50B.

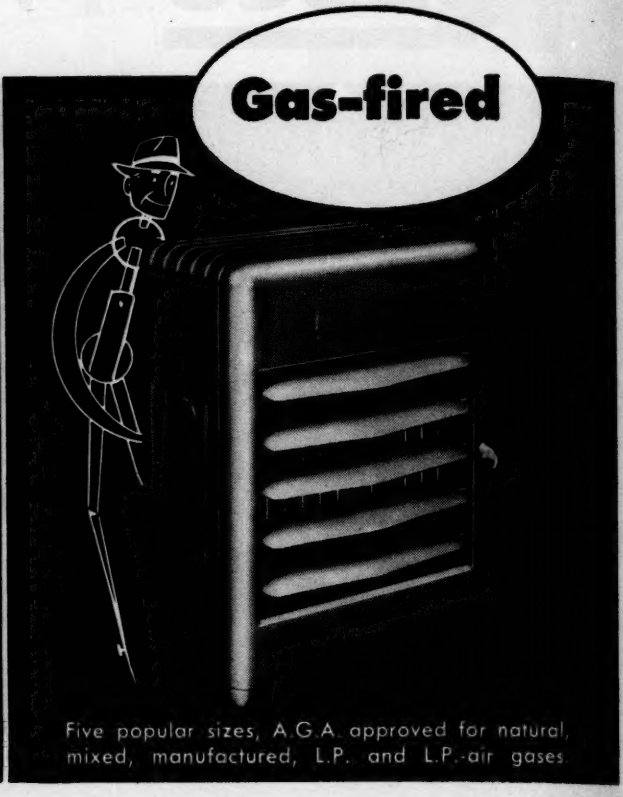



ADSCO
75 YEARS OF LEADERSHIP

**AMERICAN DISTRICT STEAM COMPANY, INC.**
**NORTH TONAWANDA, NEW YORK**

# Which type of unit heating do you require?

Built in Horizontal (illustrated), Vertical Delivery and Power Throw types — 47 different models.




Five popular sizes, A.G.A. approved for natural, mixed, manufactured, L.P. and L.P.-air gases

## In either case Modine offers you the right unit heater for your exact needs

*Modine*

**STEAM AND HOT WATER UNITS**

Special heating coil designs for steam and for hot water assure best performance for each type of system. Discharge air temperatures of 110-120° F are correctly related to air velocity for heating at its best. All-copper coils defy corrosion because fins are bonded to tubes and tubes are brazed to headers. Pre-formed tubes with individual expansion bends absorb stresses, assure long life.

*Modine*

**GAS-FIRED UNITS**

Modine is the only gas unit with both *stainless steel* heat exchanger and burner. Lighter weight means easier, less expensive installation, plus faster heat delivery — *within five seconds* after thermostat calls for it. Individually fired tubes provide higher heat transfer. Elongated ports — four times free area of conventional drilled ports — minimize clogging and simplify routine cleaning.

When you ask Modine for a unit heating recommendation, you're sure of an unbiased answer. For Modine builds steam, hot water *and* gas-fired units . . . in a broad range of types and sizes. There's no need for our heating experts to fit your job to a limited line.

Equally important, Modine has been a leader in unit heating for 25 years. Balanced design of all models assures you of perfect heating comfort with maximum fuel economy. For the right unit heater for your requirements, see the Modine representative listed in your classified phone book. Or write Modine Mfg. Co., 1511 DeKoven Ave., Racine, Wis.

**GET THESE FREE BOOKS** —Ask for Bulletin 149-A on steam and hot water and Bulletin 652 on gas-fired unit heaters.

U-1191

*Modine* **UNIT HEATERS**

DELCO
DAYTON OHIO

**whatever the application,**

*you're right with a*

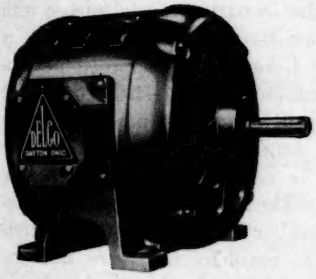
**DELCO!**

When your product requires the application of power—as a part of the product or to help make the product—you can be sure of complete satisfaction by choosing the Delco motor that's *built* for the job.

Every Delco motor that's made is engineered for the kind of *work* it has to do. It's made of the finest materials, and constructed to *stand up longer* under the roughest conditions.

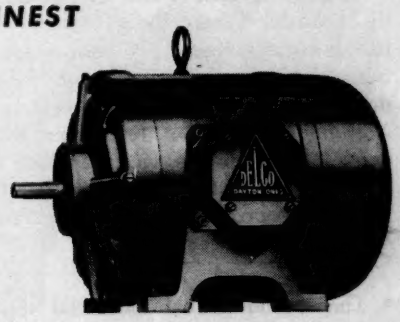
So get the facts on Delco motors *first.* You'll find Delco has the motors you need, and that Delco always meets its commitments. For complete details, write to Delco Products, Dayton, Ohio, or call the nearest sales office listed below.

***DELCO FEATURES MAKE DELCO FINEST***

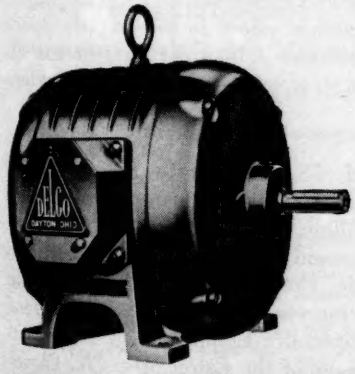


**OPEN BALL-BEARING MOTOR**

**TOTALLY ENCLOSED FAN-COOLED MOTOR**

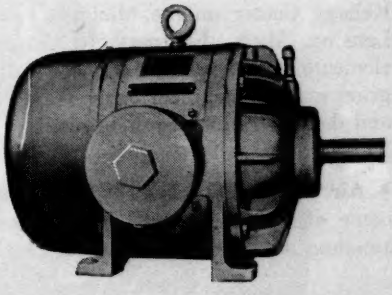


DELCO
DAYTON OHIO



**TOTALLY ENCLOSED MOTOR**

**EXPLOSION-PROOF MOTOR**



**DELCO PRODUCTS**

SALES OFFICES: ATLANTA • CHICAGO • CINCINNATI • CLEVELAND • DALLAS
DETROIT • HARTFORD • PHILADELPHIA • ST. LOUIS • SAN FRANCISCO

DIVISION OF GENERAL MOTORS CORPORATION, DAYTON, OHIO

# BRIEFLY STATED

• Dunwoody Industrial Institute has announced that the Sheet Metal Workers A.F.L. Union, Local No. 34 of Minneapolis, Minn., has provided a full supporting scholarship in the Air-Conditioning and Sheet Metal Department, covering full tuition for a year's course at the school. Applicants for the scholarship will be selected from candidates living in the state of Minnesota and selection will be made by a joint committee from the school and the union local.

• Worthington Corporation announced the following promotions: John E. Lancaster appointed assistant chief engineer of the Air Conditioning and Refrigeration Engineering Division. William C. Osborne has been appointed manager of the Research and Development Department. Norman L. Meyerson has been appointed assistant manager of the Research and Development Department. Frederick C. Gilman has been appointed research engineer. T. A. Herman has been appointed assistant chief engineer of the Reciprocating Engineering Division.

• Appleman Art Glass Works, Bergenfield, N. J., announced the change of its name to Electriglas Corp. At the same time the company's offices were moved to a newly completed office building constructed on the factory property in Bergenfield. The area previously occupied by offices is being converted into factory space.

• The nomination of Reg F. Taylor, consulting engineer of Houston, Texas, for president of ASHVE in 1953, has been announced. Nominees for other offices submitted by the nominating committee are: first vice president, L. N. Hunter, vice president of research, The National Radiator Co., Johnstown, Pa.; second vice president, John E. Haines, vice president, Minneapolis-Honeywell Regulator Co., Minneapolis; treasurer, John W. James, vice president in charge of research, McDonnell & Miller, Inc., Chicago.

• The second annual industrial ventilation conference, co-sponsored by the School of Engineering, Michigan State College, and the Division of Industrial Health, Michigan Department of Health, will be held at the Kellogg Center on the Michigan State College campus, Lansing, Mich., February 16 to 19, 1953. Projects at elementary and advanced levels will be worked out in groups under engineering instructors aided by lectures and demonstrations by field men.

• Air Conditioning Blower Mfg. Association is the new name of Furnace Blower Mfg. Association, it has been announced.

• Albert Allen Feinberg, president of the United States Air Conditioning Corp., Minneapolis, Minn., died in October. Mr. Feinberg was one of the founders of the manufacturing firm in 1924.

• With the signing of a $1.4 million order, Carrier Corporation has begun building the biggest cooling machines ever designed for air conditioning a business building for installation in the $20 million Northland Center regional shopping center being built by The J. L. Hudson Co., Detroit, Mich. Two centrifugal cooling machines will provide 3,600 tons of cooling capacity. Together they will generate cooling equal to that of the melting of 7,200,000 pounds of ice daily. That would be enough cooling to air condition from 1,200 to 1,800 averaged-sized homes during the hottest summer weather. The two machines, 11 feet high by about 14 feet wide by 20 feet long, will handle air conditioning requirements for all of the buildings currently under construction in the 161 acre project.

• The one hundredth anniversary of Frick Company will be celebrated in 1953. In preparation of this event a centennial history has been published reviewing in text and pictorially the growth of the company. The booklet will be distributed shortly before Christmas.

• Detroit Stoker Co., Detroit, Mich., announced the appointment of Maynard H. Snodgrass as vice-president of sales. Mr. Snodgrass was formerly sales manager of the New York district of the company.

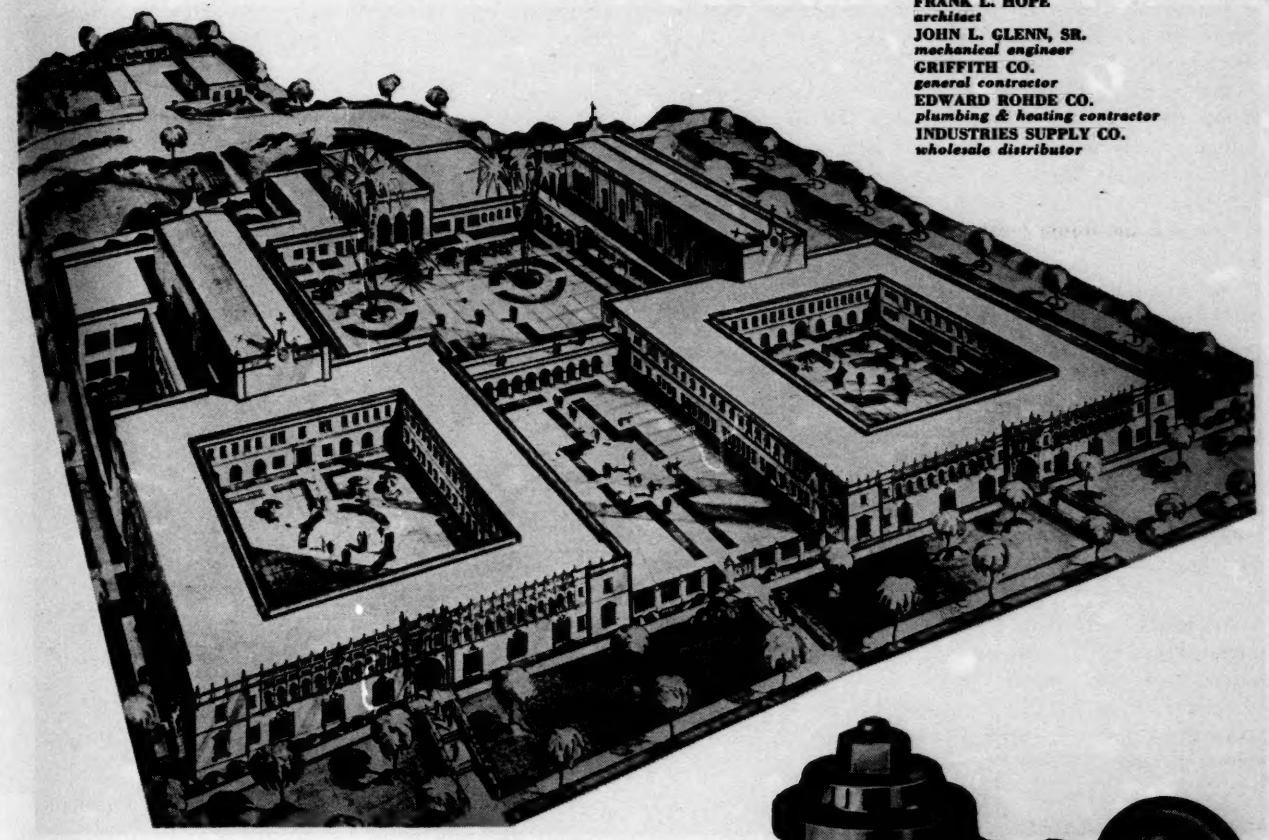
• Construction contracts awarded in the 37 states east of the Rockies for the first nine months of 1952 were 2% higher than the corresponding period a year ago, according to a report by F. W. Dodge Corp. The nine-month 1952 awards total is in excess of $12.5 billion.

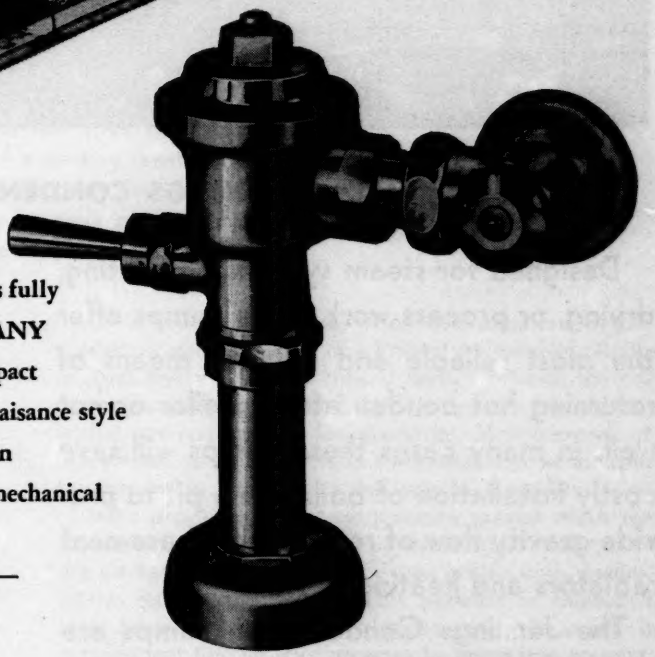
• A program to standardize components of refrigeration and air conditioning equipment used by the Department of Defense has been undertaken by the Defense Supply Management Agency of the Department of Defense with the support of the refrigeration industry. A Munitions Board Industry Advisory Committee, composed of representatives of eleven manufacturers of such equipment selected to reflect a cross-section of the industry by size of company, is collecting data necessary to complete the work. A sub-committee is considering the particular problem of compressors. The committee will develop plans for reducing the number of types of refrigeration and air conditioning units used by the three military departments to attain the maximum practicable interchangeability of parts and components. Ultimate objective of the standardization effort is to simplify spare parts supply and maintenance in order to increase efficiency and effectiveness of military supporting services to combat areas.

• William C. Ireland, 55, assistant to the president, formerly vice-president and general manager of Bundy Tubing Co., Detroit, Mich., died October 12, 1952 after a long illness. Mr. Ireland began his career with the Ireland & Matthew Mfg. Co., Detroit, where he became an officer. In the following years he became vice-president of the Detroit Metal Specialty Company and vice-president and general manager of the Eaton Mfg. Co., Cleveland. He later held the same position with Standard Products Corp., Detroit. He is survived by his wife and four children.

# *And in San Diego* – A FUTURE OF FAULTLESS SERVICE

**SAN DIEGO COLLEGE FOR WOMEN**
***San Diego, California***
**FRANK L. HOPE**
***architect***
**JOHN L. GLENN, SR.**
***mechanical engineer***
**GRIFFITH CO.**
***general contractor***
**EDWARD ROHDE CO.**
***plumbing & heating contractor***
**INDUSTRIES SUPPLY CO.**
***wholesale distributor***





Appropriate perhaps to lower California, the flavor of old Spain is strongly felt in the design of this fully integrated college campus—an unusual COYNE & DELANY installation now under completion. In this compact scheme, the traditional externals of the Spanish Rennaisance style are blended nicely with the most progressive in appointments and equipment. Contributing to a finer mechanical system through their simplicity and unmatched design will be a large number of flush valves by DELANY—the fastest growing name in flush valves.

*Under trying water conditions, an invaluable feature of all DELANY VALVES is the protected monel metal bypass shown at left. In this trouble-susceptible area in all flush valves, the use of monel precludes corrosion. Further real protection of the minute orifice against clogging by sand and debris is afforded by a fine mesh monel screen. It is sluiced clean with every flush, limiting the need for periodic dismantling and cleansing.*

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# MAXIMUM EFFICIENCY FOR STEAM HEATING SYSTEMS ON HEATING, DRYING AND PROCESS WORK.

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The Jennings Condensation Pumps are sturdy and compact in construction, and combine receiving tank, pump and driving motor in a single assembly. Pumps are bronze fitted throughout, with tobin bronze shaft. The pumping impeller is of special design, made possible by our wide experience with return line heating pumps, and is especially adapted for handling hot water with the greatest possible efficiency.

Full automatic control is furnished by means of a ball float and float switch mechanism mounted on the receiving tank. All wiring is made up at the factory, and it is necessary only to connect the pump to the system and hook up the leads. Complete information regarding these economical pumps sent promptly on request.

## THE NASH ENGINEERING COMPANY

SOUTH NORWALK, CONNECTICUT, U. S. A.

# CENTRIFUGAL FAN SELECTION

**R. G. LUBINSKY**
Manager,
Fan Department
The Trane Company

**With the wide variety of fan types, sizes and models offered to the designer of a heating, ventilating or air conditioning system—and the many factors to be considered—fan selection can be a complex job. Here, the author offers some basic principles and tips.**

THERE are many ways to move air through a system—perhaps *too* many for some of us. Confronted with an air-moving problem, the engineer must make a bewildering number of choices.

He must choose the type of fan to be installed—centrifugal, propeller, tubeaxial or vaneaxial. If he decides on a centrifugal fan he must choose between the multi-blade, forward-curved type and the non-overloading, backwardly-inclined type. Of course, fan size, horsepower requirement, noise, and speed must be decided on. Then he must choose from nine or ten different drive arrangements. Motor size and type are to be considered, also.

With certain guideposts in mind, however, the system designer can make these decisions naturally, logically and quickly. First of all, the fan must have the capacity to satisfy the air volume requirements of the conditioned space. Also, in most installations, the fan should operate at as low a sound level as possible. Finally, first cost economies must be balanced against the operating costs of the fan.

In order to make a specific selection, the engineer must first determine certain characteristics of the system.

*Air volume requirements*—The determination of the needed air volume (cfm) of a system is a complete study in itself and will not be treated here. However, the engineer should keep in mind the fact that the fan volume is that measured *at the fan discharge*. Measurements of fan volume at other points in the system can be affected by changes in temperature and relative humidity.

*Static pressure*—The static pressure against which the fan must work is that caused by the friction of the moving air against the surfaces of ducts, grilles, coils, baffles, filters, etc., in the system. This pressure is calculated from friction charts. If calculations are to be exact, it is important that velocity pressure be taken into account. The best way to avoid error is to calculate total pressures in the ducts at the fan inlet and discharge by working back from the ends of the supply and return ducts. Fan static pressure—or that static pressure which is used in selection—is equal to the static pressure at the fan's discharge minus the total pressure at the fan's inlet.

*Air density*—At normal pressures and temperatures, air density is not an important factor. However, if air density varies substantially from standard (.075 lb per cu ft) due to temperature or pressure conditions, this

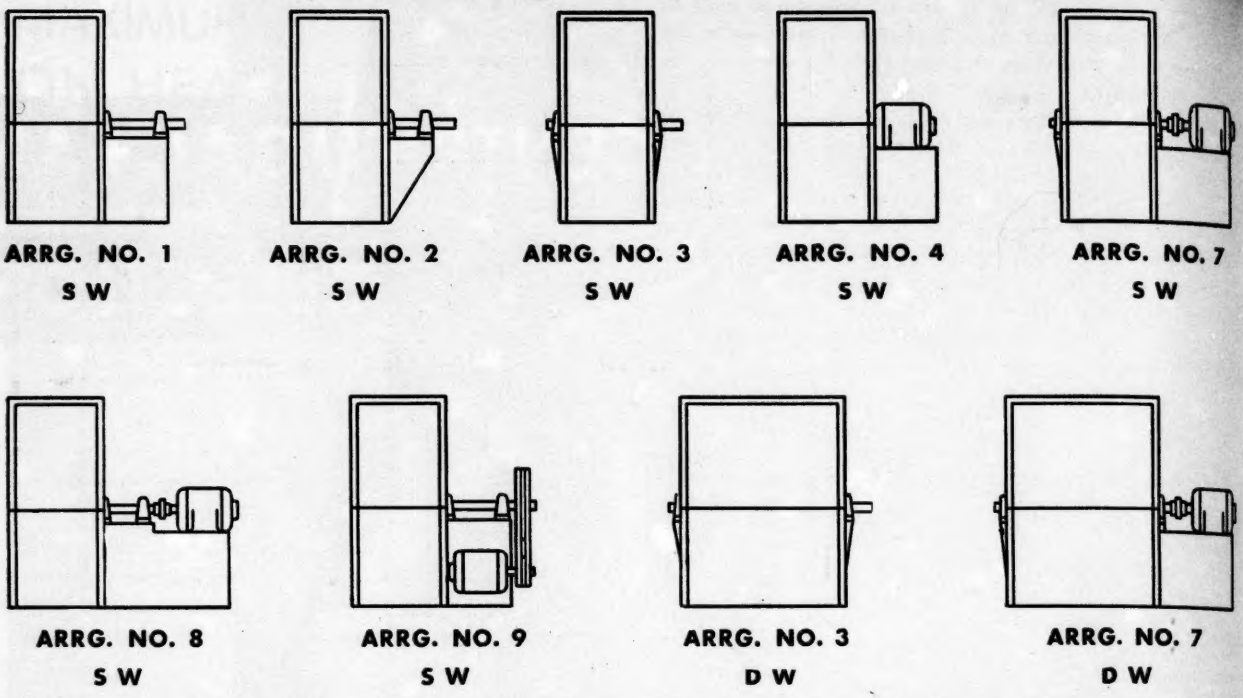



Fig. 1. Standard fan-drive arrangements for single width (SW) and double width (DW) centrifugal fans.

variation will affect the fan static pressure, and must be allowed for. Manufacturers' catalogs provide correction factors for various density changes. The air density also has a direct effect on the horsepower required to drive the fan.

*Type of application*—The characteristics of the installation—volume, static pressure and sound level—will determine the type of fan to be used. Thus, an application which requires a high volume of air delivered through a system with low static pressure could use a propeller fan if noise is not too important a consideration. On the other hand, if the fan is to deliver air against a medium or high static pressure, and it must do so quietly, a centrifugal fan will probably be best.

*Size and shape of installation space*—The fan arrangement is chosen to fit the space and the type of application. Fig. 1 shows 9 standard fan-drive arrangements of the National Association of Fan Manufacturers. For example, if the fan will be installed in a plenum space without an inlet duct connection, one of the less expensive double width arrangements may be used. Often, however, the installation will require a direct duct connection to the fan inlet. Here, one of the single width arrangements is called for. Another consideration is the condition of the air that the fan must handle. Air at very high or low temperatures, or air that is dirty can often damage fan bearings. The best arrangements for these air handling jobs are those that do not have fan bearings in the air stream. The double and single width arrangements—No. 3 and 7—do have bearings at the fan inlets and are not recommended for high or low temperature or dirty air jobs. The arrangements best adapted for these installations are standard single width arrangements No. 1, 2, 4, 8, 9 or a special arrangement offered by The Trane Company with a weatherproof hood over the motor drive section.

*Normal sound level of conditioned space*—Normal sound levels can be measured directly with sound meters in the space, or they can be estimated from calculated tables such as that in the ASHVE Guide.

*Location of fan room*—The proximity of the equipment room to the conditioned space may have a great influence on the fan selection. The closer the fan room is to the conditioned rooms, the more important quiet operation may be. Of course, the normal sound level requirements of the conditioned space will determine exactly how important quiet operation is.

*Duct length, number of elbows, amount of duct insulation between fan and first outlet*—If the fan is to be installed close to the first outlet—with just a short run of duct—there will be little chance for natural attenuation or reduction of noise, and it may be important that the fan selected be very quiet. However, if the first outlet is a considerable distance from the fan, if there are a number of elbows in the duct, and if the duct is lined with acoustical insulation, very little of the fan noise may be carried to the space. Here, a smaller, cheaper, noisier fan may be satisfactory.

The amount of noise that a fan makes in operation is governed by several factors:

(1) type of fan,
(2) fan efficiency,
(3) the static pressure that the fan must work against,
(4) mounting,
(5) reverberation of the system.

When selecting a fan for the most quiet operation, select the most efficient fan of a given type that will meet the capacity requirements. Selection of fans according to efficiency is simplified in some fan manufacturers' rating tables. For instance, Trane tables indicate the mechanical efficiency ratings for the various fans and operating conditions. Generally, the most efficient fan that will give satisfactory results will have the lowest outlet velocity of its type.

Outlet velocity and tip speeds are sometimes used as guides to quiet operation. However, these values do nothing more than keep the selection of a given fan in the higher efficiency zones.

*High static pressures and high fan noise go hand in hand.* A fan must run at a relatively high speed in order to deliver a given volume of air against higher static pressures. And higher speeds result in higher noise levels. Thus, if the most efficient fan that you can select is still too noisy, it may be necessary to re-design the system. If acoustical insulation and distance from the fan to the outlets have been utilized to the maximum, the only way to lower the noise level is to re-design the system for lower resistance.

### Example

To better illustrate this method of fan selection, it might be well to go through a step-by-step solution of a typical problem.

An air conditioning system for the west zone of an office building supplies three floors—the one on which the equipment room is located, the one above and the one below. The fan must deliver 17,000 cfm at 70F.

The static pressure at the fan discharge, calculated from the longest run of duct, taking into account grille loss, elbow loss and duct friction is ±.55 inch w.g.

Pressures at the fan inlet are measured in the return air duct just ahead of the fan. Taking into account the friction loss through return grilles, duct friction, changes in velocity, return duct elbow losses, coil and filter friction, these pressures as shown in Fig. 2 are:

| | |
|---|---|
| Static Pressure | —1.30 inches |
| Velocity Pressure | + .02 inches |
| Total Pressure | —1.28 inches |

Fan static pressure is the static pressure at the fan's discharge (±.55) minus the total pressure at the fan's inlet (—1.28). Thus the fan static pressure in this case is plus 1.83 inches w.g. It is a good practice on this type of job to add 10% to cover errors in calculations of duct friction and possible resistance offered by dirt in coils and filters.

Select the fan at 2.0 inches static pressure.

Once the fan static pressure is determined, you can proceed with the selection:

*Is a single width or double width fan best for this installation?* The equipment room in this installation is a small one; floor space is limited, but the ceiling is high. Thus a single width fan would fit best. Also, if a double width fan were used, it would not be feasible to use a duct connection between the fan inlet and the coils. Thus, the equipment room would act as a plenum chamber, and would have a static pressure of about —1.28 inches (the total pressure at the fan inlet).

With this negative pressure, the room would have to be practically air-tight to keep air from entering the room and the fan without passing through the filters and coils. This air, by-passing the filter and coils, would mix with the air supply and reduce the heating and cooling effect of the system. The unfiltered air would also introduce dirt into the supply system. Thus, a single width fan would be recommended in this system.

*Should the fan be direct driven or belt driven?* On this installation, the fan will operate at a relatively low

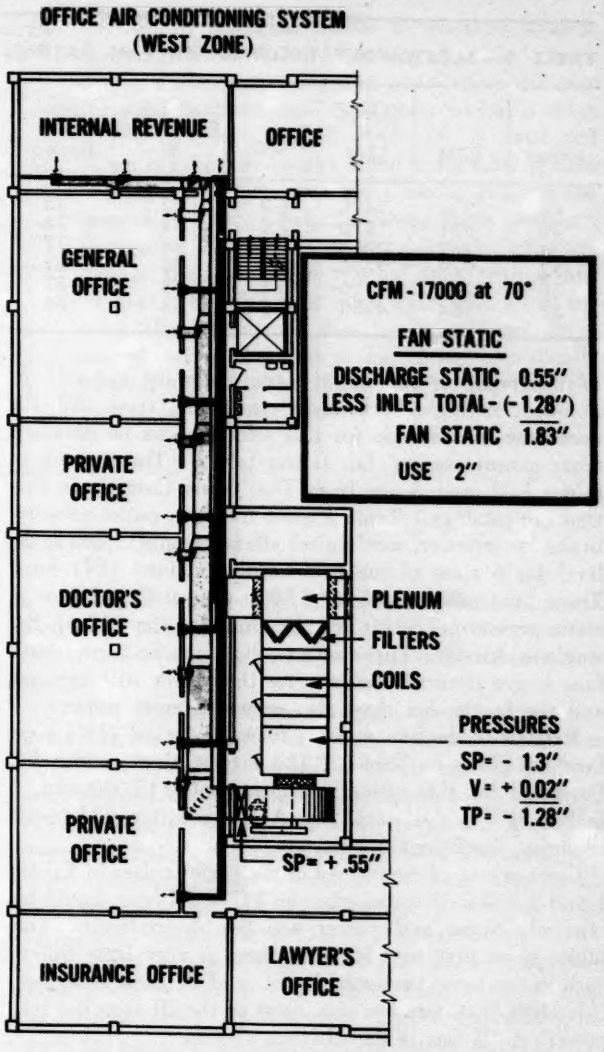



Fig. 2. Plan of example air conditioning system.

speed. Low speed motors are more expensive than the standard 1750 rpm motors. Thus, a belt drive with a standard motor will be preferable here.

*What fan arrangement should be used?* Since the fan will be a single width, belt-driven model, the choice of arrangements is narrowed to No. 1, 2, 3, 9 or such manufacturers' modifications as the hooded drive previously mentioned. A direct duct connection will be made between coils and fan inlet to eliminate leakage of equipment room air. With this direct duct connection, it may be desirable to keep the fan bearings out of the inlet to make for easier servicing. However, this is not essential. Since the air is clean (passing through filters before entering fan) and at moderate temperatures (70°), it won't have a harmful effect on the bearings. It will be safe to use an arrangement that has bearings in the inlet. A quick look at the fan rating tables shows that our fan will probably be larger than those available in Arrangement 2. Arrangements 1 and 9 are more expensive than Arrangement 3, and their advantages are not critical in this case. The hooded drive arrangement is best suited for outdoor installations. Therefore, an Arrangement 3 fan should be used.

*What type fan should be used?* Noise and power consumption will be the determining factors in the selection

**TABLE 1—BACKWARDLY INCLINED (BI) FAN RATINGS**

| Fan Size Inches | RPM | Outlet Vel., FPM | BHP | Mechanical Efficiency, % | Coded Noise Rating |
|---|---|---|---|---|---|
| 44 | 534 | 1490 | 6.9 | 82.5 | 75 |
| 40 | 631 | 1820 | 7.0 | 84 | 76 |
| 36 | 762 | 2210 | 7.9 | 81 | 77 |
| 33 | 949 | 2700 | 8.6 | 76 | 82 |
| 30 | 1206 | 3300 | 10.5 | 68 | 85 |
| 27 | 1584 | 4050 | 13.8 | 58 | 88 |

of the type of fan—multi-blade (forward curved) or non-overloading (backwardly inclined) type. All the necessary information for this selection can be obtained from manufacturers' fan rating tables. (Those given in tables 1, 2, and 3 are from The Trane Company's current fan catalogs.) Table 1 gives the rpm, outlet velocity, brake horsepower, mechanical efficiency and coded noise level for 6 sizes of the backwardly inclined (BI) fans. These fans will all deliver 17,000 cfm at 2 inches w.g. static pressure. The largest size shown is the 44-inch BI, single width fan. There is no advantage in considering fans larger than 44 inches since the power will increase and the larger fan may also generate more noise.

Ratings of the five possible forward curved (FC) type fans are given in Table 2. The largest single width FC fan rated for this system's requirements (17,000 cfm, 2 inches SP) is a 40-inch fan. A larger fan would result in noisy, inefficient operation.

Comparison of the ratings of the various sizes in Tables 1 and 2 will indicate whether an FC or BI type should be selected. Noise and power are the determinants. The tables show that, size for size, there is very little difference in the noise produced by FC and BI fans. However, it is clear that, size for size, most of the BI fans use less power. A BI fan is the obvious choice.

*What size fan should we install?* Six different sizes of the BI fan will meet the system's air requirements. Power, noise and cost will tell us which to use. Table 1 shows that there is little difference in the power requirements and noise level of the 40- and 44-inch fans. Both require a 7½-hp motor. The 40-inch fan will give about the same results and will cost less, so the 44-inch model may be eliminated.

We can also drop the 27-inch and 30-inch fans, as they require a 15-hp motor and have a noise level that is quite a bit higher than the next larger fan. This reduces the selection to the 40-, 36- and 33-inch sizes.

The 40-inch fan will use a 7½-hp motor; the other two require 10-hp motors. Table 3 gives some representative prices for the various fans, motors and drives that would be required for each size.

**TABLE 2—FORWARD CURVED (FC) FAN RATINGS**

| Fan Size Inches | RPM | Outlet Vel., FPM | BHP | Mechanical Efficiency, % | Coded Noise Rating |
|---|---|---|---|---|---|
| 40 | 367 | 1820 | 8.6 | 70 | 77 |
| 36 | 417 | 2210 | 8.9 | 69 | 78 |
| 33 | 474 | 2700 | 9.9 | 66 | 79 |
| 30 | 552 | 3300 | 11.7 | 61 | 80 |
| 27 | 661 | 4050 | 13.8 | 58 | 82 |

The table shows that the 40-inch fan rig will cost just about the same as the 36-inch, but slightly more than the 33-inch size. There is no reason to consider the 36-inch rig further, since it costs about the same as the 40-inch rig, yet requires more horsepower. The choice is between the 40- and the 33-inch rigs.

Because of the difference in power requirements, the 40-inch fan will have a lower operating cost than the 33-inch rig. Depending on power costs and amount of usage, the saving could be from $75 to $125 per year. This saving will make up the difference in first costs in about a year. The operating cost determines the choice here. Therefore, the 40-inch fan is recommended.

*Will the fan be quiet enough?* The subject of sound and the noise produced by fans is a large and complex one. Space does not permit a discussion of it here; however, certain factors must be considered if the fan installation is to be successful. The first of these factors is the noise level of the fan itself. The noise we are concerned with is that of the air stream in the fan discharge. However, fan noise, as determined in accordance with the National Association of Fan Manufacturers' code, is measured only in the space *around* the fan—not in the discharge. The noise in the fan discharge is somewhat greater than these coded ratings. Experts disagree on the exact amount, but it will be from 10 to 20 decibels greater. Any calculations of fan noise levels should be used only with extreme caution.

The next sound factor to be considered is that of attenuation in ducts. The natural attenuation of sound in the duct between fan discharge and the room outlet can be calculated from information given in standard references.

In the sample installation, there are offices above, below and adjacent to the equipment room. Therefore, it is advisable that the fan and motor would be mounted on an isolating base, and canvas connections used between the ducts and fan. The office opposite the equipment room is the critical one as far as noise is concerned—it is the one most likely to be affected by transmission of the fan's noise through the ducts.

After determining the sound level of the office and the natural loss of the fan's noise through the ducts, the designer can tell whether or not his fan and system will be too noisy. If the system as designed is too noisy, two solutions can be considered:

(1) Static pressure (resistance) of the system can be reduced to decrease the fan sound level.
(2) Discharge ducts can be acoustically treated.

**TABLE 3—COMPARATIVE COSTS—BI FANS**

| Item | Fan Size, Inches | | |
|---|---|---|---|
| | 40 | 36 | 33 |
| | Motor Size, HP | | |
| | 7½ | 10 | 10 |
| | Cost, Dollars | | |
| Fan | 845.00 | 745.00 | 655.00 |
| Base | 54.00 | 49.00 | 47.00 |
| Motor | 278.00 | 360.00 | 360.00 |
| Drive | 81.00 | 89.00 | 78.00 |
| Total | 1258.00 | 1243.00 | 1140.00 |

Reduction of the fan static pressure requirements can entail a complete redesign of the whole system. In this case, the simplest and most economical solution would be to line the duct with acoustical insulation. Data given in source literature can be used to determine the amount of lining and baffling necessary for the particular requirements of the system.

Here are four outstanding facts that can serve as useful tools in the selecting of centrifugal fans for any system:

(1) The fan selection for any given job cannot be based entirely on outlet velocity or tip speed. The minimum outlet velocity and tip speed that can be used depends on the static pressure that the fan must develop.

(2) Savings in first cost should be checked against operating costs in making any final selection. Often, a more expensive fan installation will pay for itself in lower operating costs within a short period of time.

(3) A fan is generally noisier when it operates against a high static pressure than when it delivers the same air volume against a lower static pressure.

(4) Generally, fans operating at a high efficiency are quieter than the same type of fans with a low efficiency. For the most quiet operation, select the most efficient fan. If this fan is still not quiet enough after the system has been acoustically treated, the only alternative is to redesign the system for a lower static pressure.

## Warm Air Panel and Convection Compared

Bulletin 401 issued by University of Illinois Engineering Experiment Station presents the first results obtained in Warm-Air Heating Research Residence No. 2, which was a one-story structure of frame construction with a large amount of glass exposure and with a full basement. The convection system that served as a basis for comparison was a conventional forced warm-air heating system which included an extended-plenum trunk duct and high-sidewall registers. The panel system was of the warm-air ceiling panel type in which the depth of panel space, the air-flow rate, and the circulating air temperature deviated considerably from those used in an accepted proprietary system. The performance of the panel system is representative only of the warm-air ceiling panel system as installed; it does not necessarily represent that which might be obtained with other transfer media or other locations of the panel. For both systems a single gas-fired forced-air furnace was used.

The following summary of the results obtained in Research Residence No. 2 is applicable to the conditions under which the investigation was conducted.

(1) As far as room-air temperatures and average room-surface temperatures were concerned, the performances of the panel and convection systems were remarkably alike. The panel system produced a wider zone of minimum air temperatures near the exposed wall in the living room than did the convection system, even though the range of temperatures from maximum to minimum was about the same. The room-air temperature differentials in the living zone were less for the panel system than for the convection system.

(2) The mean radiant temperatures determined with a thermo-integrator were slightly higher for the panel system and differed only slightly from the room-air temperatures. The same conclusions were reached when comparisons were made of average surface temperatures for the two systems.

(3) Even though a conventional room thermostat was used for both the convection system and the panel system, no difficulties were experienced with either system in the automatic temperature control. No temperature over-runs or thermal lags were experienced with the panel system under normal operation with a constant thermostat setting.

(4) When the thermostat setting was reduced 10 F for an 8-hr night-time period, the panel system required about twice as much time (5 hr vs 2½ hr) for recovery to the original room-air temperatures as did the convection system.

(5) The fuel consumption for the panel system was higher than for the convection system. Adequate insulation of the ducts in the attic as well as of the top side and exposed edges of the panel space was shown to be essential.

(6) Although temperature conditions in the first-story rooms were satisfactory with the unheated basement, improvements were noted when the basement was heatd, since smaller room-air temperature differentials and warmer floor-surface temperatures were obtained.

(7) When heat was supplied to the basement the fuel consumption was about 10% higher than when no heat was introduced into the basement. The corresponding increase in basement-air temperature was about 7F.

(8) The results obtained with continuous operation of the blower showed lower fuel consumption but higher electrical consumption than with intermittent operation.

(9) The use of a minimum differential setting for the room thermostat produced remarkably uniform room-air temperatures. For the low air-flow rates used, the minimum differential setting of the room thermostat was more effective for close control of air temperatures than was the fan-switch setting.

(10) For the purpose of selecting the maximum fuel input rate it was concluded that the total heat loss from the structure, including the basement, should be considered regardless of whether or not the basement was heated.

(11) Both direct heat regains (lights, cooking, appliances, sun, and occupants) and indirect heat regains (furnace casing, furnace bonnet, basement ducts, wall stacks, flue pipe, and chimney) affect the actual performance of any heating plant. They are suggested as a possible explanation of the similarity in performance of the panel and convection systems, and also of the deviations between design and performance values for each system. Performance values may be appreciably less than design values, thus providing a margin of safety for extreme weather conditions.

(12) The extended-plenum system provided a satisfactory method of air distribution to the branch ducts.

# Operation and Maintenance of

# Air Conditioning Equipment

F. EDWARD INCE

Sales Application and Research Engineer, Marlo Coil Co., St. Louis, Mo.

**Simple rules to follow to insure good mechanical performance of an air conditioning system, and a maintenance program which will help the equipment to function properly.**

AIR conditioning equipment is designed to perform a particular function in the most efficient manner possible and to give good mechanical performance. But before the expected results can be achieved, it is necessary to (1) so install the unit that there are no conditions that are detrimental to good operation; (2) operate and maintain the unit so that a continuance of satisfactory operation is assured.

While there are many parts to an air conditioning system, this article is concerned with cooling towers, evaporative coolers and evaporative condensers, and also with air conditioning units. This is not a theoretical presentation of information, but a collection of practical pointers, based on years of experience, to guide engineers who want to get the most out of such equipment.

One point that many engineers slight is that not only must equipment have enough space for installation, but there must be sufficient clearance around the unit, Fig. 1, to enable proper servicing and operation. There should be sufficient space to permit oiling of bearings, removal of coils, fans and shaft, eliminators and wetted deck surface, servicing the spray water pump and strainer and for the air conditioning unit; enough room for servicing fan and pump motors, and the belts. Space should be allowed to permit the use of brushes and other equipment to clean the coils in the unit.

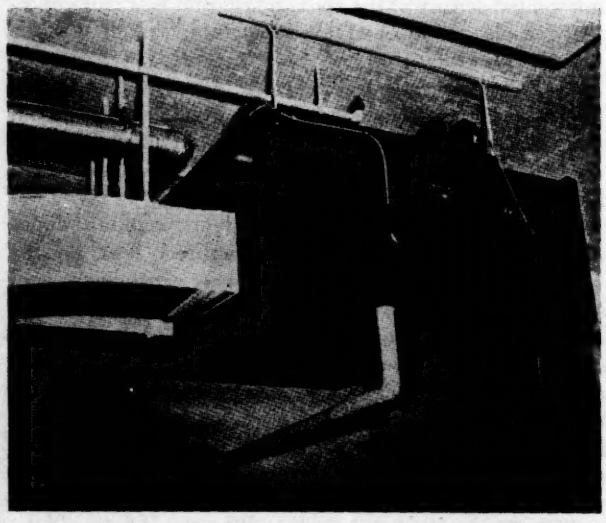


Fig. 1. Allow enough room around unit for servicing equipment.

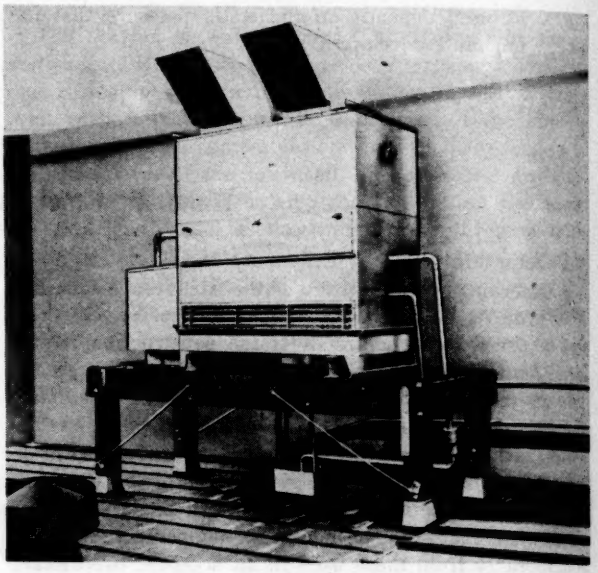


Fig. 2. Evaporative condenser unit should discharge its air above the roof line.

It is important that the units are lined up horizontally and vertically so that there will be proper slope for satisfactory drainage.

## Water Saving Devices

Air discharge from water-saving devices, Fig. 2, should be above the roof line, and well above and as far as possible from the air intake. Since dirt and fumes carried into the unit aggravate the problem of keeping clean the heat transfer surfaces, air entering the apparatus should be kept as free as possible from dirt, fumes and steam. Simple upward direction of the air discharge is not sufficient, and the back-wash effect of air currents flowing over buildings should be taken into consideration. Both the air inlet and outlet should be kept free from obstructions that might impede the free flow of air. Runs of discharge duct inside the building should be insulated to reduce condensation on the inside and the ducts should be made water tight.

Before starting equipment, remove the belts and be sure that fans and pump rotate freely. Fill the oil cups on the fan and motor bearings before the electric wiring is completed. Then check the motor and replace the belts. Belts should be adjusted to prevent slipping when starting. However, too much tension will cause rapid wear on both belts and bearings and an unnecessary load on

the motor. It is important to check the motor for correct rotation. Directional arrows serve as a guide.

Fill the pump with water and then check and adjust the float valve, Fig. 3, to maintain proper water level—not more than one inch below the overflow pipe. Place the 3/8 inch waste line from the spray header inside the overflow cap. Next open the waste line valve at the spray header about two turns, and with the aid of a gallon bucket, check the flow rate. Set the waste at about 2 gph per ton of refrigeration or per 15,000 Btu per hr heat rejection, and then adjust as required under operation.

### Operation

Since the spray water system is designed to maintain a running film of water on all heat transfer surfaces, it is necessary to maintain the spray pumping unit in good operation. As one check, see that pump and motor bearings are properly lubricated, that the stuffing box is not binding the shaft, and that the fan and pump belts are maintained in proper tension and alignment. It is advisable to waste enough water so that the mineral concentration does not exceed that point at which scale will form. One must remember that in operation about one pound of water is evaporated per 1,000 Btu and that the mineral content of this water is left after evaporation takes place.

Some mineral salts are more scale-forming than others, and it may be advisable to treat the water with compounds which form soluable and non-scaling type of salts after combining with whatever minerals are present. There are companies that specialize in recommending suitable water treatment. Where wasting of water does not solve the problem, water treatment by some competent company is recommended.

From the cleaning standpoint, it is important that the sump tank should be drained and cleaned often enough to prevent large accumulations of sediment that are carried into the unit through the air stream. Pump suction strainer should be cleaned and the spray nozzles checked to see that each is producing a full spray cone and that all parts of coil or wetted deck surface are flooded. Air intake screens should be kept free of leaves and paper, and a check made that boxes or crates do not obstruct free flow of air into the unit.

It is important to note (1) the in-going and out-going temperatures of the fluids to be cooled, (2) temperature of the spray water, (3) the in-going and out-going air temperature, and occasionally (4) the volume of the air. Readings that deviate from normal, indicate the need for closer inspection of the apparatus and the equipment served by it.

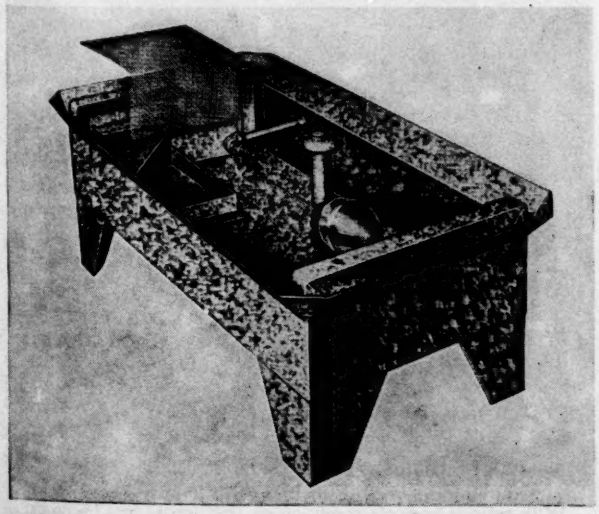


Fig. 3. Sump pan showing float valve and overflow pipe.

### Air Conditioning Units

All systems using a direct expansion refrigerant should be thoroughly tested for leaks before and after the system is charged with the refrigerant. Particular attention should be given to the thermal valve packing. Avoid any condition that creates gas in the liquid line but if such a condition is unavoidable, provide adequate subcooling of the liquid with a heat exchanger to prevent gasification.

Water coils, sump pan, and various water lines, should be adequately drained and blown out for winter operation to prevent freezing of these components. During winter operation, if the unit is shut down for any period, the steam coils should also be drained to prevent freezing. Water and steam coils are circulated and sloped in the unit at the factory for proper drainage. Precautionary methods should be taken at all times during winter operation to prevent freezing in the steam coils. Adequate filters should be placed on water, steam and humidifier lines to prevent dirt accumulation in the coils.

The pump should be located as close as possible to the unit sump tank and one should always avoid a high suction lift. In no case should the total suction lift, including friction in the pipe, be more than 15 ft. If the pump is to handle hot water, it must be so located that water will flow freely into the suction.

On units with face and bypass dampers, make certain that the dampers are properly linked for full opening and closing.

Periodic maintenance and inspections should be enforced to insure long and dependable service. About every 60 days, inspect the damper bearings and linkage, and check fan and motor bearings. A suitable oil should be added. Fans and scrolls should be free and clean of all foreign matter.

Once a year, it is good policy to shut down the unit and thoroughly clean all surfaces, remove all scale and rust deposits and protect surfaces with a good corrosion resistant paint where necessary. One should remember that the misuse of strong acids or alkali solutions is dangerous and can result in sérious damage to this equipment. Interior parts should be brushed and freed of loose particles. As a safeguard, paint bare metal before using any cleaning solutions. After using any chemical, wash, brush clean all surfaces, and repaint as necessary for further protection. However, do not paint coils on evaporative coolers.

Pumps require attention. Clean, flush and inspect the pump, checking water passages and impeller clearance; clean and regrease pump bearings; and every six months, the pump should be greased. All worn or damaged parts should be replaced. In addition, inspect the motor and motor mounting brackets and at the same time clean and oil the motor. However, keep oil away from fan belts and

pulleys. Inspect pulleys for worn or damaged grooves and make such replacements as are necessary.

### Air Conditioning Maintenance

Maintenance resolves itself into a program of cleaning and inspection. Every 60 days, the fan and motor bearings should be checked and the proper type of oil added. Also periodically check the tightness and alignment of belts.

Clean the strainer and the pipe in the spray piping as often as necessary. There is no set rule for the periodic cleaning of spray piping and nozzles, but when any nozzle does not have a full cone spray, it should be cleaned. The constant waste valve and waste line should be checked periodically to insure free flow of waste water to the drain. Examine the float valve for proper function, and replace the valve seat if it is worn.

At regular intervals, inspect the water humidifier and steam jet humidifier nozzles, and clean if necessary. On vapor pan humidifiers check for the proper functioning of the float valve. Because of water evaporation, these pans will accumulate salt scale deposits so that it is important to flush the pans at least once a month during the winter season.

All coils should be carefully washed with a hose once a month to remove accumulated lint or foreign matter carried to the unit by the air stream. Fans and scrolls should also be washed or brushed down to remove the accumulated dirt. Incidentally, clean or replace air filters when dirty.

Before a unit is to be shut down for a long period of time, at the end of either the cooling or heating season, it should be thoroughly drained, well flushed out and cleaned, belt tension relieved, and the unit given a coat of corrosion-resistant paint, especially in spots where rust might appear.

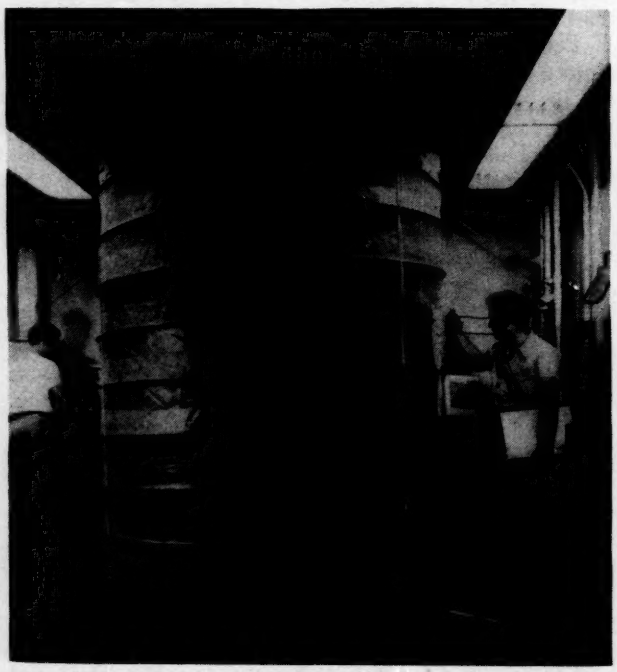
The sump pump on spray type dehumidifier units should be drained and thoroughly flushed at least once every two weeks. If scale deposits appear on the cooling coils, the water should be treated to remove the existing deposit and to prevent new formations.

## Large Diameter Tube Provides a Testing Enclosure

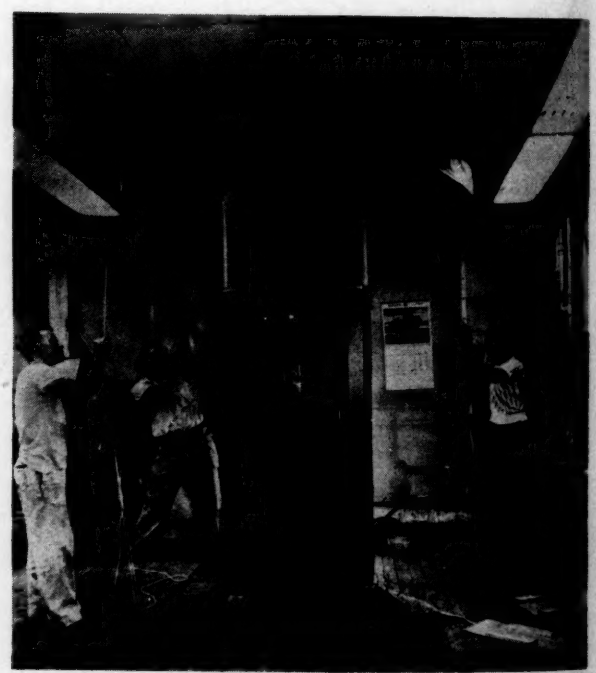
A section of flexible tubing, claimed to be the largest ever made, has been fabricated to serve as a room calorimeter in the Development Laboratories of the Air Conditioning Division, General Electric Co., Bloomfield, N. J. It is being used for testing self-contained air conditioners.

The tubing is 7 ft in diameter and over 10 ft long when extended. In operation, the upper end of the tube is secured to the test room ceiling and by means of cord and pulleys, the tube can be raised to the ceiling when necessary. By lowering it around an air conditioning unit that is to be tested, it provides a room within a room condition. Readings can be taken from wet and dry bulb thermometers placed in front of a specially designed opening in the closure. Through this 2 ft x 3 ft opening, 6,000 cu ft of air can be delivered at a velocity of 1,000 fpm, and then drawn off through ductwork in the ceiling. Arrangements are provided for taking readings of the air exhausted.

This Spiratube enclosure is produced by Flexible Tubing Corp., Guilford, Conn., and is made of neoprene impregnated duck supported by spring wire 0.244 inch in diameter. This tube enclosure is said to meet testing specification details of the American Society of Refrigerating Engineers.



Flexible tube encloses a self-contained air conditioning unit which is being tested under controlled room conditions.



With tube raised, air conditioning unit under test becomes accessible on all sides.

# Ultra-safe Heat Loss Calculations Increase Costs and Halt Building

R. L. STINARD

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**By being too conservative in the design of heating systems for buildings, engineers call for too much radiation and equipment. A method is suggested for cutting the calculated equivalent square feet of radiation and the cost of installation.**

ARE engineers too conservative in calculating and designing heating systems for some types of buildings? If this ultra-convervatism does exist, then the obvious results are overloading of the job with equipment and in many cases overheating the building.

Consider the multi-story office building for which first and operating costs have both risen to such points as almost to prohibit their construction. In view of these higher costs, it is the duty of architects and consulting engineers to do everything within their power and skill to design the building with a minimum of equipment and yet be efficient and economical to install and operate.

Partially open windows in offices are quite common in the winter. Open windows during the heating season mean that the building is overheated, and this in turn indicates that operating costs for the heating system are high. These are the two factors that engineers can, in the writer's opinion, partially overcome.

It is believed that radiation requirements for office buildings can and should be reduced by taking into account the following factors: average minimum outdoors design temperature; interior lighting load; occupancy; partitioning, and stack effect.

## Outside Design Temperature

According to the ASHVE *Guide* the recommended base outdoor design temperature is taken at 15 degrees F above the lowest temperature recorded. Taking New York City as an example, the lowest temperature recorded was —14F, which occurred some 15 years ago; therefore, on this basis, the outdoor design temperature is zero F. However, before this extreme low temperature was recorded, the previous low for this same city was —6F, which would result in a design temperature of 9F, although zero F was the standard even at that time.

It would seem, since the extreme low temperature was recorded only once, that engineers are in error to use this as the basis for establishing their design temperature.

An analysis by Humphreys, and reported in an ASHVE paper recently, showed that in a 23-year period, New York City's minimum temperature averaged as follows: —6F was attained once every 3 years; —3F was attained once every 2 years; 0 F was attained once every year.

As a matter of fact, however, these extreme low temperatures are reached almost invariably in the early morning hours prior to office occupancy, so that, in other words, we are designing for an infrequent condition which normally occurs during non-occupancy periods.

It seems to the writer that in the case of New York City, a design temperature of 10F would be perfectly safe. The saving in equipment costs to the building owner on this basis would be approximately 15%.

## Lighting Load

In calculating internal heat gains in connection with air conditioning design, engineers take into account the heat equivalent of lighting fixtures of 3.4 Btu per hour per watt of lights installed. Heating engineers, however, ignore this heating effect of lights, presumably on the grounds of conservatism.

Lighting loads in commercial buildings, during the past ten years have been increasing, no doubt due to better promotional work on the part of illuminating engineers and manufacturers. Effective foot-candles of lighting have been practically doubled; this, in turn, has increased the watts per square foot of floor space from an average of 1.5 per sq ft to 3 and 4 per sq ft. As a result, lighting loads have increased to the point where in modern office building work it is almost a necessity to cool the interior areas of each floor even during extreme cold weather.

In view of these high lighting loads, why shouldn't the heat equivalent be utilized for offsetting some of the normal heat losses? A safe figure for this would be 1.5 watts, or 5.1 Btu per square foot per hour of rentable floor space, this figure being based on 50% of an assumed 3 watt per sq ft lighting load.

On this basis, using as an example a typical 20 ft by 15 ft exterior bay of a building, the credit would be 1,530 Btu per hour, or 6.37 sq ft of E.D.R.

## Occupancy

Similarly, in air conditioning design, account is taken of the heat equivalent of human beings but this is neglected in heating calculations.

A reasonable assumption and credit towards heating requirements, would be to take an occupancy load of one person to every 200 sq ft of rentable floor space to determine the number of occupants and to allow 200 Btu per hour per occupant.

In the typical bay of 20 ft by 15 ft there would then be the equivalent of 1.5 persons, 300 Btu per hour, or 1.25 sq ft E.D.R. While this seems small, an office building containing between 1,000 and 1,500 persons, which is not unusual, would have a credit of between 1,250 and 1,875 sq ft E.D.R.

When engineers are called upon to design heating systems for office buildings, they usually start work from

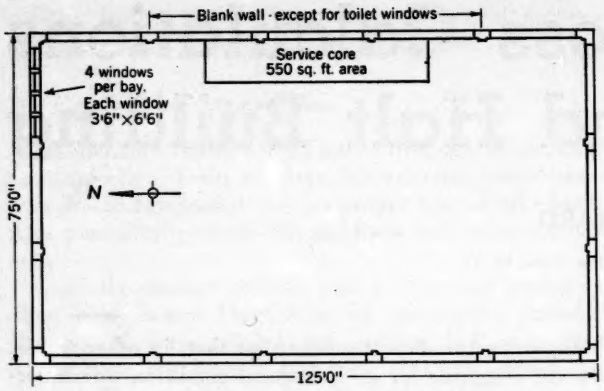



Fig. 1. Floor plan for design problem.

a preliminary set of architectural plans which do not indicate any partitioning for the office spaces within the floors. Elevators, stairs, shafts and other utility service spaces are the only partitions usually indicated.

New buildings are usually leased on an "open floor" basis and the tenant is required to erect his own partitions to meet his requirements.

In non-ventilated or non-air conditioned buildings (where internal pressure is not maintained) infiltration must be calculated by either the crack or air change method. Whichever method is used in computing infiltration, the effect of partitioning the floor is considerable on the amount of infiltration. For example, whereas the engineer must of necessity assume an open flow, since his plans show no partitions, then the calculated infiltrated air theoretically moves across each floor, with little or no obstruction to its points of exfiltration.

A fair assumption to make along this line would be to reduce the infiltration by 50%, this figure of course being subject to judgment and experience of the engineer and depending on the interior depth of the building under consideration.

### Stack Effect

Stack effect in tall buildings has been the subject of much discussion among engineers, but actually it seems that little is known about it, other than it does exist under certain conditions of construction.

It has been the practice of engineers in the past to increase or decrease their calculated heat losses by varying percentages for lower and upper floors to compensate for this stack effect. Percentages used by engineers not only vary, depending on the designer's own rule, but the location of the neutral zone of no stack effect was anyone's guess.

Stack effect in tall buildings has been practically eliminated under modern building design, since all vertical openings between floors are required to be sealed under the various building codes. For example, fire towers and stairhalls must have self-closing metal doors; elevator shaft doors are required to be solid, and modern elevator doors are tight fitting and usually have rubber meeting strips where the doors meet on closing. The tendency of this type construction is practically to eliminate stack effect, which did exist in old buildings where open stairwells and open elevator shafts were standard.

It is the opinion of the writer that with modern building construction, and without any definite stack effect test data, upon which to base calculations, that this item can be neglected.

To illustrate the possible savings in initial installation costs which can be made by applying the foregoing principles, a 20-story office building to be erected in New York City has been calculated. A typical floor plan is shown in Fig. 1. A summary of design data follows:

Rentable floor area, 8,429 sq ft; ventilation, none; windows, double-hung steel sash, single glazed; wall, U = 0.28; ceiling height, 11 ft; heat from lights, 5 Btu per sq ft; heat from people, 1 person per 200 sq ft of floor or 200 Btu per person.

Col. *A* calculations are based on zero F outside design temperature; no credit for heat gain; unrestricted infiltration.

Col. *B* calculations are based on 10F outside temperature; deducting light and human heat gain; 50% infiltration.

A comparison of heat loss calculations for this typical floor follows, Column *A* being by the present method, Column *B* being modified as outlined.

| | *Col. A* | *Col. B* |
|---|---|---|
| Outdoor design temperature.. | 0F | 10F |
| Indoor design temperature... | 70F | 70F |
| Heat loss, wall and window.. | —143,940 | —123,370 |
| Heat gain, lights..... | ..... | 42,290 |
| Heat gain, people..... | ..... | 8,140 |
| Infiltration loss ..... | —57,000 | —28,500 |
| Net loss per floor, Btu per hr.. | —200,940 | —101,440 |
| Total loss, 20 floors, Btu per hr | —4,018,800 | —2,028,800 |
| Equivalent sq ft radiation.... | 16,700 | 8,410 |
| Cost, at $4 per sq ft..... | $66,800 | $33,640 |
| Saving, *B* over *A*..... | ..... | 49.6% |

In the foregoing comparison, no allowance was made in the calculations for transmission losses through roof, nor was allowance made for exposure safety factor.

From this analysis it can be seen that the installed radiation, installation and operating costs can be reduced considerably and, in addition, the tendency for the building to overheat during normal average winter weather will be reduced.

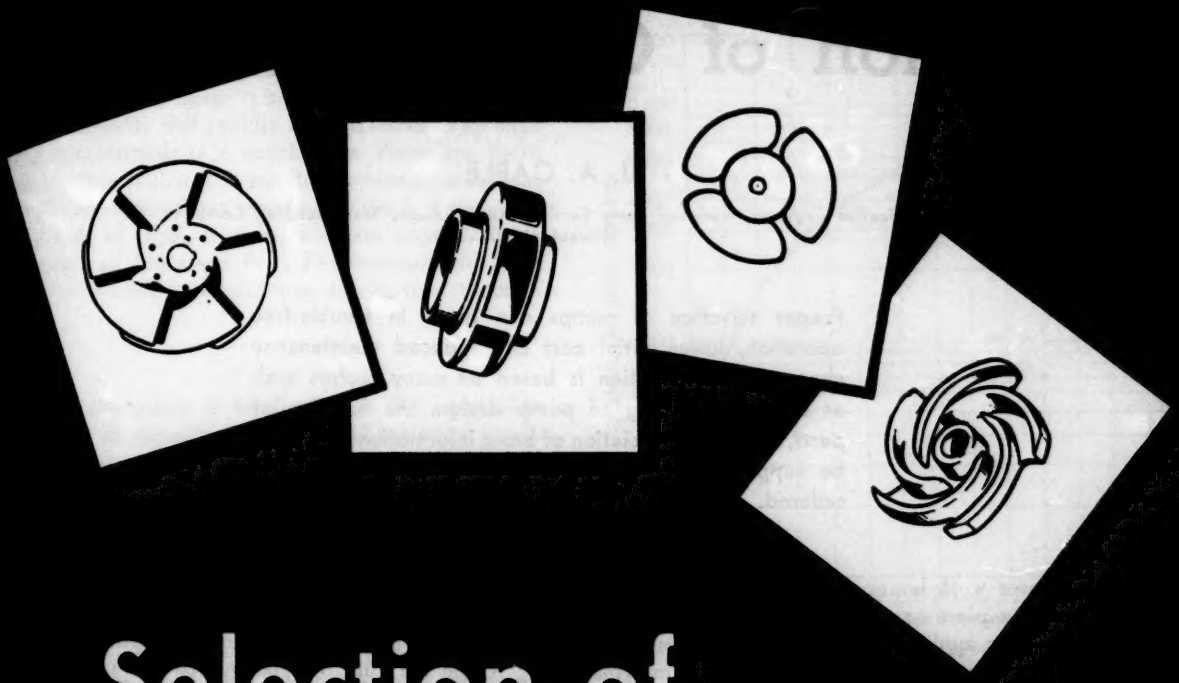
It is apparent that there is a large reduction in heating surface required, but it is believed that the figures used are conservative, inasmuch as other sources of heat gain in the building have not been taken into account, as:

*Solar heat.* Equivalent to approximately 200 per 300 Btu per sq ft of window area on south and west walls.

*Heat losses from risers (exposed or concealed).* Heat losses from risers if exposed, act as radiating surface and should be credited against the building heat loss. This also applies to exposed radiator runouts and branches. Risers even though concealed and insulated are still within the confines of the heated spaces and help raise the temperature of the building.

*Electrical Office Equipment.* Today's business methods require large usage of electrically-operated business machines such as adding machines, comptometers, addressographs, etc. These machines generate heat for which no allowance was made.

A further reduction in operating costs for the heating system, which would decrease overheating and tendency to open windows even with the reduced radiation, would be the installation of individual temperature control valves on each radiator.



# Selection of Centrifugal Pumps

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Heating and Ventilating Magazine's Reference Section

# Selection of Centrifugal Pumps

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**Proper selection of pumps can result in trouble-free operation, lower initial cost and reduced maintenance charges. Such selection is based on many factors such as an understanding of pump design, the function of parts, and an appreciation of basic information that must be supplied to the manufacturer before the pump is ordered.**

DID you ever work hours at a jig-saw puzzle only to find that a piece or two were missing? Then you know how a pump application engineer feels when working on an inquiry that supplies "almost" enough information for a sound pump selection. While he can make assumptions to round out his data, if he guesses wrong the whole job may have been in vain. Many lightly considered factors are equal in importance to the more obvious ones and all necessary points should be considered.

To insure that complete data are on hand, most pump manufacturers provide a form on which the various items of information can be tabulated. The more complete the data submitted, the better will be the pump selection that results.

## Information Needed and Why

Let us consider what information is necessary for the proper selection of a pump, and why. First, are the general information items which establish the identity of the prospective application. Included are such basic facts as customer's name, address, plant location, inquiry and item numbers. These are easy to obtain and normally are given in sufficiently complete detail. The item number is worthy of specific attention, particularly if a number of items are to be considered at one time. For example, if John Jones wants to buy pumps which he designates pump No. 23 and No. 24 in building No. 7, use of these numbers in all correspondence establishes correct identity.

Often the duty or type service performed is essential. For instance, boiler feed pumps might have the same rating as special dewatering pumps, but entirely different pumps would be suitable, especially as concerns materials of construction. Periods of operation will often materially affect pump selection. With a pump that is to run 24 hours a day, 7 days a week, efficiency is very important, while for a standby unit that is to run a few hours once in a while, more consideration should be given to the original cost.

Such a relatively simple item as "number of units" can very materially affect several other factors. Should you require a considerable number of duplicate units, it is within reason to consider the possibility of designing a special impeller or even a special complete pump just for your application. Large quantities will affect promised shipment and may reflect in the quoted price of the equipment.

**TABLE 1—CONVERSION FACTORS FOR U. S. GALLONS PER MINUTE**

| Given Unit | Equivalent U. S. GPM |
|---|---|
| 1 Pound per minute | 0.12 |
| 231 Cubic inches per minute | 1 |
| 1 Cubic foot per minute | 7.481 |
| 1 Cubic foot per second | 448.8 |
| 1,000 Pounds per hour | 2 |
| 1 Imperial gallon per minute | 1.2 |
| 1,000,000 Gallons per 24-hour day | 695 |
| 1 Barrel of oil per minute | 42 |
| 100 Barrels per hour | 70 |
| 100 Barrels per 24-hour day | 2.92 |
| 1 Liter per minute | 0.2642 |
| 1 Liter per second | 15.852 |
| 100 Liters per hour | 0.44 |
| 1 Cubic meter per minute | 264 |
| 1 Cubic meter per hour | 4.4 |
| 1 Acre foot per minute | 326,000 |

## Capacity

To select any centrifugal pump, we must have the capacity and head ratings that the pump will be expected to produce. The capacity must be in a recognizable unit, generally in terms of U. S. gallons per minute. However, no matter what the unit is, be sure to be specific as to volume unit and time element. Do not say the unit will pump 100,000 gpd unless you say whether this day is 8 hours or 24 hours long.

Table 1 lists conversion factors to change capacity measurements to U. S. gallons per minute.

In many cases a range of capacity is required. Be specific as to the capacity at which the rated head is to be obtained as, almost without exception, any appreciable change in quantity results in some corresponding alteration in the head that is developed. When a wide range is desired, it may be well to consider using more than one pump for a given job. This is especially true if one of the extremes of this range is required for a majority of the total operating time. It is also important to consider future operating conditions which are to be fulfilled by the same equipment. Be sure to identify properly both

present and future capacities so that while the present rating can be obtained now, future operating conditions can be obtained by some alteration at a later date. Changes in capacity will rapidly effect friction in systems involving considerable pipe and fittings. Therefore, there are limits within which it is feasible to obtain additional capacity. These restrictions result from the fact that with the same size of pipe, friction increases approximately as the square of increased flow. For instance, doubling the capacity increases the friction almost four times.

## Head

The head the pump is to develop is the companion factor used with capacity in rating and selecting a suitable centrifugal pump. It is essential that the head should be described in definite recognizable units. Table 2 gives a number of conversion factors to provide for calculations of head in feet that are equivalent to other head and pressure measurement units. In almost all pumps, the manufacturer works in terms of head in feet and the next most common basis is pounds per square inch.

Naturally, the total head which the pump will be expected to develop is our basic interest, but it is also necessary to know or assume how that total head is arrived at in terms of suction and discharge heads. It has become quite a general practice to assume, when information as to suction conditions is not supplied, that if there is suction lift it will not be in excess of 15 ft. If suction conditions are extreme in either the high or low range with respect to this 15 ft lift assumption, it can have as much or more bearing on pump selection than all other factors combined. When the equivalent suction lift is high and approaches the theoretical limit of 34 ft at sea level for cold water, this problem becomes critical to the extent that there are specially designed pumps to handle these extreme conditions. On the other hand, if positive equivalent heads on the suction exist, it is often practical to use a smaller pump with complete satisfaction. Here again, when this condition gets to an extreme there are other factors involved which require that complete correct information be considered. The suction condition limitation is that the algebraic total of suction and discharge heads must not exceed the pressure limitations for which the casing has been designed. There are some special pumps for extremely high total pressure service with comparatively low developed head and these should be considered when necessary.

## Net Positive Suction Head

If all pumping involved handling cold water at sea level, there would be little need for concern about suction head or lift conditions. Since this is not the case, there

**TABLE 2—CONVERSION FACTORS FOR HEAD IN FEET**

| Head or Pressure Unit | Equivalent Head in Feet |
|---|---|
| 1 Pound at 1.0 specific gravity | 2.31 |
| 1 Inch of mercury | 1.134 |
| 1 Meter | 3.281 |
| 1 Kilogram per square cubic meter | 32.84 |
| 1 Atmosphere | 34 |
| 1 Short ton per square foot | 32.07 |

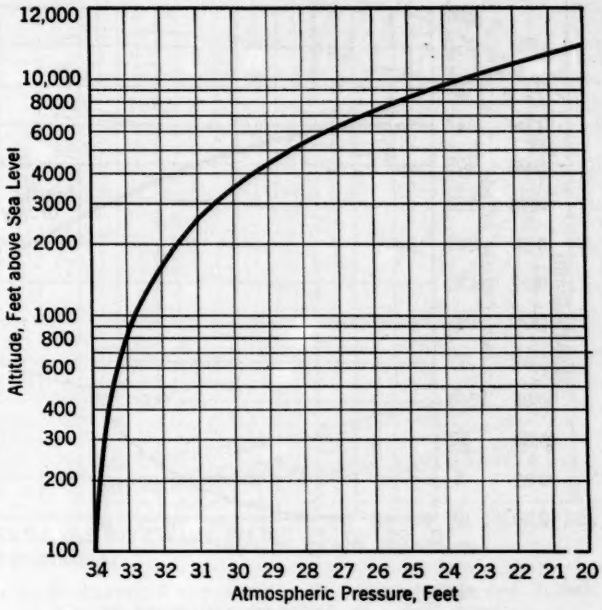


Fig. 1. Effect of altitude on atmospheric pressure.

are a number of factors which must be considered collectively to get the complete picture of a pump installation's available suction condition. To express this combined calculation in one universally applicable form, the designation "net positive suction head" above vapor pressure has been adopted, abbreviated as NPSH. It can be figured on the basis of the proposed installation and this result compared with the NPSH required by pumps that might be applicable. The available NPSH must equal or exceed the required NPSH of the chosen pump for the pump to operate satisfactorily.

The available NPSH is figured as follows:

$$\text{NPSH} = \frac{2.31\ (P_A - P_V)}{\text{Sp. Gr.}} + H_E - H_F$$

Where $P_A$ = Pressure of the atmosphere or pressure in the suction vessel, if it is enclosed, in psi

$P_V$ = Vapor pressure of the liquid at pumping temperature, in psi

Sp. Gr. = Specific gravity at P. T. (pumping temperature).

$H_E$ = Elevation head, ft. If the difference in elevation between the static suction liquid level and the horizontal centerline of the pump impeller is positive, this is a plus factor. If this value is negative, this is a minus factor.

$H_F$ = Friction head in feet in the suction piping system considering all of the pipes, valves, and fittings up to the pump suction flange and including entrance losses from the suction vessel into the piping.

Fig. 1 gives the relationship between altitude above sea level and atmospheric pressure. Fig. 2 plots the effect of temperature change on specific gravity and vapor pressure of water.

The easiest way to picture the effect of variation of any of these factors in the formula is to compare results as each changes. As an example, let us take: Required 1000 gpm; 175 ft head; 10 ft suction lift, including friction.

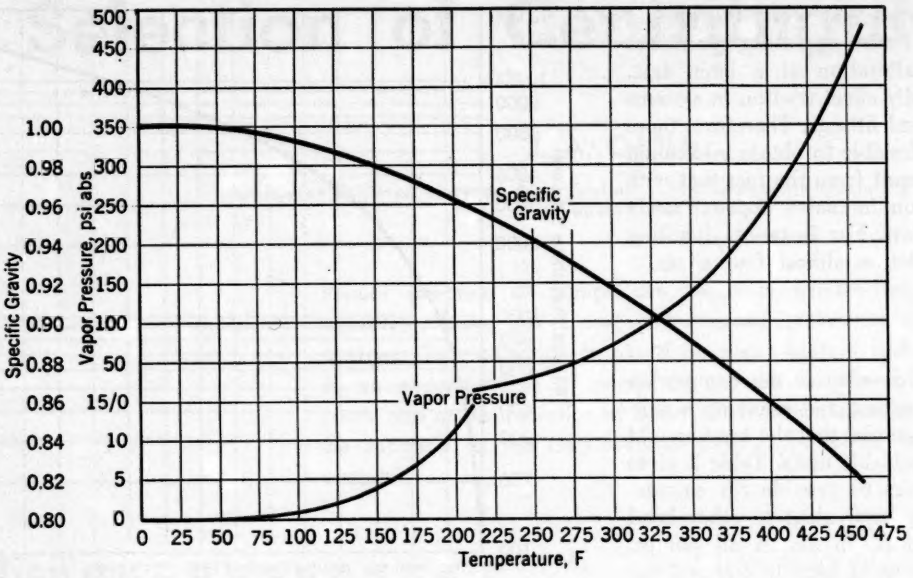



Fig. 2. Effect of temperature change on specific gravity and vapor pressure of water.

(1) Assume we are handling cold water from a tank, open to the atmosphere, and the installation is approximately at sea level. The available NPSH from the previous formula equals 34 − 10 = 24. In the formula given, since $P_V$ or vapor pressure of cold water is 0, the first term of the formula becomes 2.31 × 14.7 as the specific gravity is 1.0. Since the example stated a 10 ft suction lift, including friction, $H_E - H_F$ is − 10. Therefore, NPSH = 34 − 10 or 24 ft. For this case the pump with characteristics shown in Fig. 3 would be suitable.

(2) Next, let us take this whole system and install it in a plant in mountainous country where the only change is in elevation above sea level. From Fig. 1, we get the entire first term of the formula. At 9,200 (the condition of the problem) we find the atmospheric pressure is 24 ft since in this case, the specific gravity still equals 1.0 and $P_V$ remains 0. Thus, NPSH = 24 − 10 or 14 ft. This makes it necessary to use the size pump indicated by the curves of Fig. 4. There will be the same results if we stay at sea level but increase the pumping temperature to 157F. Then the vapor pressure, $P_V$, becomes 4.5 and specific gravity, 0.979

$$\text{NPSH} = \frac{2.31\ (14.7 - 4.5)}{0.979} - 10$$

Since the loft of the example includes suction lift, neglecting friction, we have 24 − 10 or 14 ft.

(3) If at times either installation in (2) were subject to low water conditions in the suction vessel to where lift would be increased to 15 ft, we further reduce available NPSH to 9 ft and a pump with Fig. 5 curves would be required.

### Oak Tree Curves

In order to show the range which can be produced by one pump, data are grouped in a family of curves known as Oak Tree Curves, as in Figs. 3 to 5. This terminology stems from their appearance as they look like a cross section through a tree with the efficiency lines representing the annual rings of the tree. These approximately vertical efficiency lines are those marked, for example, 49, 73 or 77 in Fig. 3. Where these lines close in and encompass a specific area, the efficiency is labeled in the center of the area. On each curve, the best point of efficiency is then the highest numbered enclosed area, such as number 78 in Fig. 3.

The upper family of lines running approximately horizontal and labeled 10½, 11⅛, etc. (Fig. 3) are head capacity curves with the labeling done according to impeller diameters. The capacity scale runs across the bottom of the graph and the head scale upwards in the left margin. This lower set of curves plots BHP against capacity for each corresponding impeller diameter. The BHP scale is also in the left margin.

The vertical dotted lines indicate the pump's limitations as to suction lift and required NPSH. In Fig. 3, for example, the dotted line for 25 ft suction lift and re-

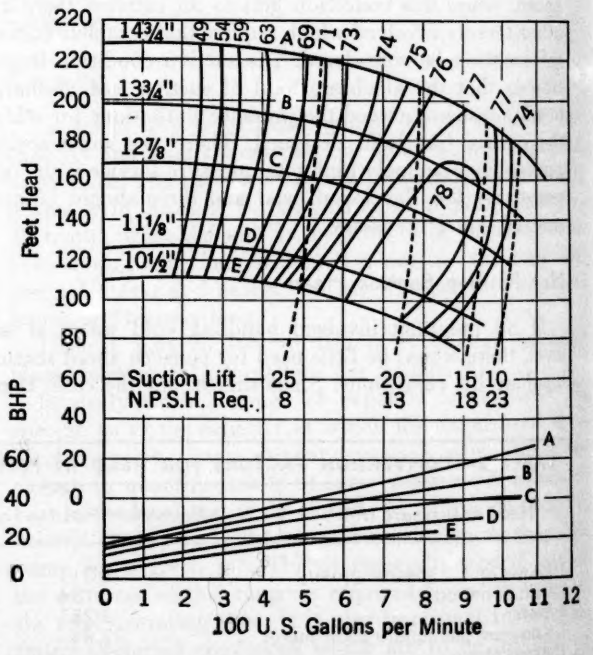



Fig. 3. Curves for a pump having 5-inch suction and 4-inch discharge and operating at 1,750 rpm.

quired 8 ft NPSH indicates that any rating on or to the left of this line could be produced with the suction conditions prevailing. If the suction lift was more than this, or the available NPSH less, the pump having this curve would discharge less capacity.

Of course, each of these factors can be affected in one installation so that many combinations result. However, if, in each case, the worst possible condition is considered for each factor, there is every chance of obtaining a pump that will do its intended job. Each of the examples was with water as the liquid handled. Other liquids would have a different series of values for each factor which should be considered at pumping temperature. To be sure that the pump will come up to rating at all times, the worst extremes should be used. For instance, when handling hydrocarbons such as gasoline, the $P_V$ factor will be highest at the highest pumping temperature.

## Speed

Generally speaking, for clear liquids with no abrasives carried in suspension, the highest speed pump that will do the job will also be the most economical. Since the NPSH required by a given pump for a given rating is higher at higher speeds, it will often be necessary to run at 1,800 rpm or even slower speeds to suit the available NPSH of a given installation. Quantity varies directly with speed but head varies as the square of any speed change so a higher head requirement may limit the choice to 3,600 rpm.

One other reason favoring 3,600 rpm occurs with steam turbine driven units as it is usually easier to get a better steam rate at higher speeds. Inversely, high speeds (over 1,800 rpm) are seldom sought when the drive will be by gasoline or diesel engines.

In some cases, there may be existing drivers which could be employed and many times a suitable pump can be selected to fill this requirement. When existing drivers are to be employed, then, if possible, their description should be fairly complete. If it is a motor drive, the frame size and type of enclosure should be stated in addition to the obvious horsepower and speed factors. If existing drivers are not to be used, it is generally preferred that the choice of speed be left to the pump manufacturer. In most cases, the pump's operating rating will immediately establish the speed necessary.

More likely than not, one may have future alterations in mind which might effect pump selection. In some industries, for instance, it is standard policy to request that

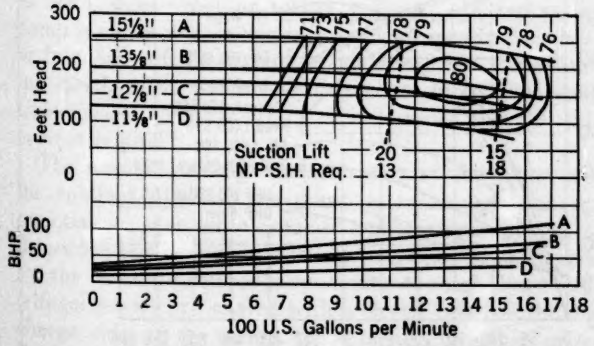



Fig. 4. Curves for a pump having 6-inch suction and 5-inch discharge and operating at 1,750 rpm.

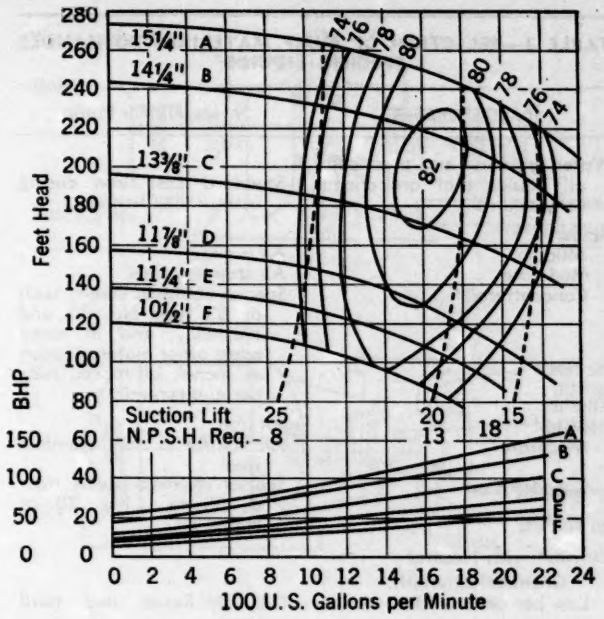



Fig. 5. Curves for a pump with 8-inch suction and 6-inch discharge and operating at 1,750 rpm.

the pump selected shall not require the maximum diameter impeller with which it can be furnished. This automatically considers the future possible usage of the equipment. In many cases, if future ratings to be expected are considered at the time of inquiry, the unit can be supplied with a motor large enough for the future rating, thus requiring only a new impeller at the time of change-over. The practicability of this thinking depends on many factors such as time of operating at present rating and amount of change for new rating.

Sometimes the future rating will be made by additional pumps operating in series or parallel with present installations. Of these possibilities, let us start with series operation where the design of the casing, in order to keep all units alike, may be effected. For instance, with two pumps in series, the second casing must withstand the developed pressure of both units and it may have to be reinforced or be made of special materials. Since it would be well to have interchangeable parts throughout for the sake of repair parts inventory, the first unit purchased should be identified as part of a series unit in future plans. In order to operate in parallel, the important consideration is the shape of the performance curve. It should continually rise to shut off (no flow). Often if there is a wide range of quantity of liquid to be pumped, it will pay to buy two pumps to operate in parallel initially. For instance, for a 1,000 to 2,000 gpm range at a fairly constant head, it would be quite impractical to use one pump unless the larger rating was necessary for a majority of the operating time.

## Liquid Handled

The liquid pumped is naturally very important when the liquid is either corrosive or abrasive or combines these two actions. In the hydrocarbon family, increased volatility becomes extremely important as it concerns the limitations placed on the suction conditions. There are two possible basic treatments of pump applications re-

**TABLE 3—SELECTION OF PUMP MATERIALS TO HANDLE SPECIFIC LIQUIDS**

| Liquid Handled | Materials for Pump |
|---|---|
| Water, gasoline and practically all liquids that are chemically neutral. | Standard cast iron casing with bronze fittings. |
| Acids: | |
| Mild | All bronze |
| Moderate | All stainless steel |
| Concentrated | Special stainless steels, such as SS type No. 20 and Hastelloy, and in many cases other materials such as monel, all-nickel, rubber and ceramic. |
| Alkalis: | |
| Mild | All iron |
| Moderate | All Ni-Resist or stainless steel |
| Concentrated | Special stainless steels such as SS type No. 20 or Hastelloy. |
| Slurries* with Neutral Chemical Strength: | |
| Low per cent solids | C.I., Ni-Resist and hard irons. |
| Moderate per cent solids | Hard iron and chrome steels. |
| Concentrated solids | Chrome steels, Ni-hard, manganese steels. |

*If slurries contain all minus ⅛ inch mesh solids, rubber lined pumps are excellent providing temperatures are within range of limitations for rubber.

garding materials to be used for the various liquids handled; (1) the prospective user has had considerable experience with similar applications and can tell the pump manufacturer how to construct the pump; (2) the user may ask for recommendations based on the manufacturer's experience with applications of similar nature. From the manufacturer's standpoint, (1) is naturally preferred, but when it exists, (2) is of greater concern. This means that the liquid description need not be as complete when customer's specifications cover desired construction as when the pump builder is asked to recommend a pump for a certain rough duty application.

With any special liquids that are corrosive, abrasive, or both, it is usually the policy that customer's are responsible for material selection, whether their own or solicited from the supplier.

Often, several materials might be expected to serve under the given conditions. Their degree of suitability usually is related to their original cost. On one extreme, a pump staying on the job as little as a week or a month might represent a reasonably good life, and extra expense for super alloys would be uneconomical. On the other hand, it is more likely that special alloys will be worth their higher price in resulting reduction of maintenance and down-time. Table 3 lists some liquid groups and gives the relative applicability of several alloys.

If you want advice on construction and type of pump that will do your job, the following "liquid description" points should be covered as completely as possible.

*Name of Liquid.* Be as specific as possible and instead of meaningless terms such as "dilute solution," use the percentage basis. With some acids, the exact percentage of solution will greatly affect the selection to the extent that this factor alone can decide whether or not any metal is satisfactory.

If solids are present, completely describe them as to percentage, size and nature. For the most part, the concern with solids is whether or not they are abrasive. If particles are large, state whether or not they are of such a nature that they would break up when pumped.

*Specific Gravity.* This is particularly important if the head required is specified in pounds of pressure. Pumps are rated in feet head and to convert pounds per square inch head to foot head, the formula is:

$$\text{Head, ft} = \frac{\text{Pressure, psi} \times 2.31}{\text{Sp. Gr.}}$$

Specific gravity will also effect the BHP required, and thus help select driving equipment.

*Pumping Temperature.* If temperatures of operation are extremely high or low, this factor can have considerable bearing on materials and mechanical construction. For example, many so called standard pumps are limited for use with liquid temperatures up to 250F. Inversely, when liquids such as brines and coolants are handled at sub-zero temperatures, it is often advisable to use special alloys for shafts and pressure-containing elements of the pump. Be specific and if a temperature range is involved, state both limits plus a time factor for the high, low and normal conditions.

*Vapor Pressure.* This factor has its greatest effect on

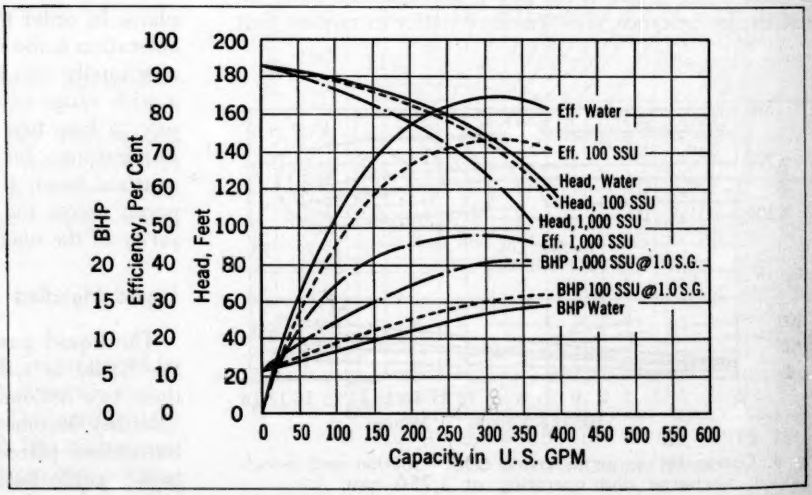



Fig. 6. Curves showing the effect of using a pump designed for water for viscous fluids. Performance curve for pump with 3-inch suction, 2½-inch discharge and operating at 3,500 rpm.

pump suction conditions. If these conditions are specified in the form of available NPSH, the vapor pressure need not be separately considered.

*Viscosity.* Unless information is given to the contrary, the pump supplied can only be rated as it would be for handling water. Water is thin enough so that lighter viscosity will have little effect on operation, but when viscosities increase above 100 or 200 SSU (Saybolt Seconds Universal) there is a marked effect on pump selection. For the most part, the disc friction factor is the reason the viscosity effects pump performance. Therefore, the greatest effect is on the horsepower required to produce a given rating. However, when viscosity increases above the 100 to 200 SSU range, the head and capacity developed can also be effected.

Fig. 6 shows the relative curves obtainable when using a pump originally designed and rated for water in an application handling viscous liquids. Since viscosity changes with temperature, these two factors must be given accurately. Many liquids are, for instance, described as 1000 SSU viscosity at 60F, while the pumping temperature may differ considerably from this reading. When such description is used, be sure to indicate temperature at which viscosity is determined.

### Drives

The drive data group of questions are usually quite easy to answer, but the answers are essential to proper performance and life of the pump and to the performance and life of the driving equipment.

Inquiries are seldom received wherein the horsepower is specified in advance unless the pump is a replacement or existing equipment is to drive the pump. Frequently, however, a preference exists for a specific operating rpm. When solids are suspended in the liquid to be pumped, high speed equipment is often not desirable. Pump manufacturers can try to provide pumps for a specified speed and will use an existing drive whenever possible. If the requested rating cannot be obtained with a certain drive, minor changes in head and capacity may be worth considering so that the drive can be used.

Most head-capacity charts are based on 60-cycle induction motor speeds and any change in speed will correspondingly alter the range of ratings obtainable. When using synchronous motors, the data must include the power factor (pf) if the pump manufacturer is to supply the motor. In many borderline cases, the selection of horsepower rating of motors is made on the basis of permissible temperature rise, and type of protection such as open, drip proof or totally enclosed. As far as the pump is concerned, however, be sure to specify the cycles or frequency of the current as this determines the operating speed, when pump and motor are direct-connected. Unless stated to the contrary, it is assumed that 60-cycle current is used.

The normal starting characteristics of the pump and the routine in which the pump is to be operated are essential for very large capacity and low head pumps, to determine the necessary starting torque to be developed by the motor. Generally, moderate to high head centrifugal pumps are started with a closed valve on the discharge side of the pump. This is done because under these conditions the starting horsepower which the motor must develop to bring the pump up to speed before opening up the valve is between 35 and 60% of the horsepower required at the pump's rated operating condition. With large capacity and low to moderate heads, where mixed or axial flow type pumps are applied, the shut-off (no flow) horsepower at least equals and usually exceeds the horsepower required at the pumps normal operating point. With moderate head mixed flow pumps, this ranges from 100 to 150% of load at rating, and with low head axial flow pumps, it can be as high as 300%. In the two latter cases, motors with extra starting torque or special starting arrangements (such as automatically controlled discharge valves for the pump) need to be provided.

When the drive is to be by diesel or gasoline engine, then other data are required, if the pump manufacturer is to quote on the engine. He must know whether the unit will be installed indoors or outdoors (so as to provide proper weather protection), elevation above sea level,

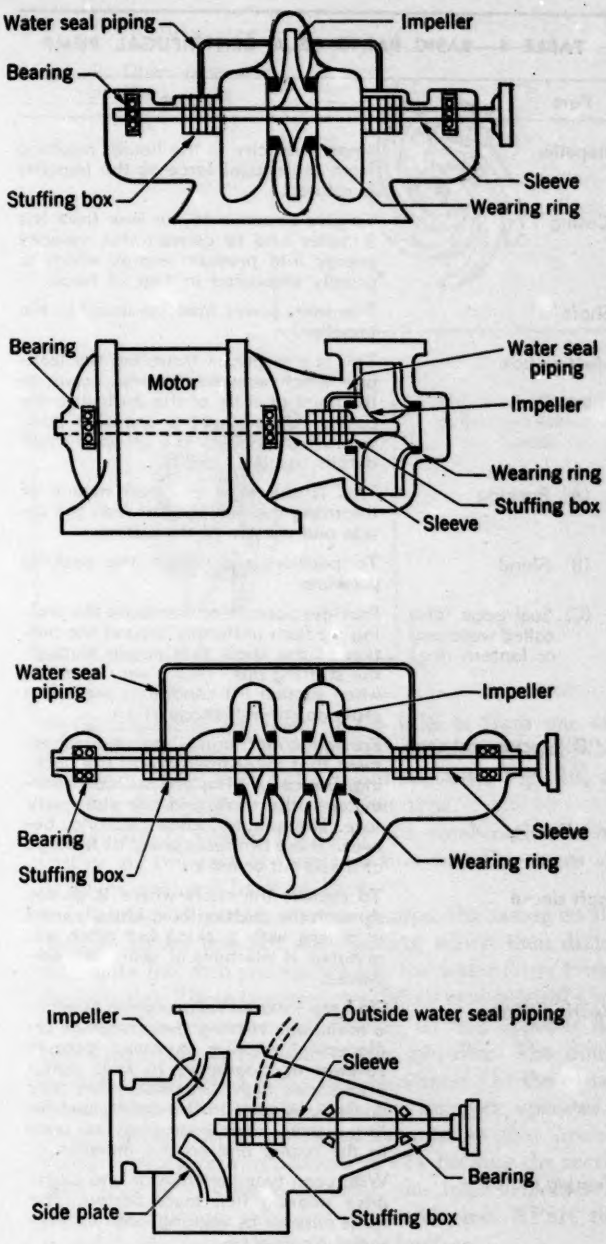



Fig. 7. Typical assembly sections for pumps.

**TABLE 4—BASIC PARTS OF A CENTRIFUGAL PUMP**

| Part | Purpose |
|---|---|
| Impeller | Impart velocity to the liquid, resulting from centrifugal force as the impeller is rotated. |
| Casing | To give direction to the flow from the impeller and to convert this velocity energy into pressure energy which is usually measured in feet of head. |
| Shaft | Transmits power from the driver to the impeller. |
| Stuffing box | This is a means of throttling the leakage which would otherwise occur at the point of entry of the shaft into the casing. Usually not a separate part, but rather made up of a group of small details, as "A" to "D". |
| (A) Packing | This is the most common means of throttling the leakage between the inside and outside of the casing. |
| (B) Gland | To position and adjust the packing pressure. |
| (C) Seal gage (also called waterseal or lantern ring) | Provides passage to distribute the sealing medium uniformly around the portion of the shaft that passes through the stuffing box. This is very essential when suction lift conditions prevail to seal against in-leakage of air. |
| (D) Mechanical seal | Provides a mechanical sealing arrangement that takes the place of the packing. Basically it has one surface rotating with the shaft and one stationary face. The minutely close clearance between these two faces prevents leakage of liquid out or air in. |
| Shaft sleeve | To protect the shaft where it passes through the stuffing box. Usually used in pumps with packing but often eliminated if mechanical seals are employed. |
| Wearing rings | To keep internal recirculation down to a minimum. Having these rings as replaceable wearing surfaces permits renewal of clearances to keep pump efficiencies high. On small types only one ring is used in the casing and on larger sizes, companion rings are used in the casing and on the impeller. |
| Wearing plates | With open type impellers or end clearance wearing fits, these perform the same purpose as wearing rings do with radial clearances. |
| Bearings | Accurately locate shaft and carry radial and thrust loads. |
| Frame | To mount unit rigidly and support bearings. In most single suction pumps this is a separate piece. In many double suction pumps, the support is through feet cast as part of the casing. In some special single suction pumps, the feet are also part of the casing and the bearing assembly is overhung. With close coupled single suction types, this support is provided by the motor or by special supporting adapters. |
| Coupling | To connect the pump to the driver. |

type of starting accessories and mufflers desired. The time cycle of operation is very important since engines are normally rated about 25% lower for continuous duty than for intermittent or stand-by operation.

For steam turbine driven equipment, the necessary information is readily obtainable, but care should be taken to have it complete and accurate. Here, again, any changes planned for the forseeable future should be outlined. Since steam rates are better at high speeds, it is well to consider geared units if the pump is to operate at speeds of 1,800 rpm or slower.

Many smaller pumps are V-belt driven. This is particularly true in any application subject to variable output requirements. As long as drive horsepowers and speeds come within the limitations for overhung sheave drives, this type unit is readily adaptable. When the power involved exceeds safe limits, which vary with each size and type, it becomes necessary to use jack shafts and pedestal bearing arrangements to support the driven sheave.

One other method of driving is to use two drivers, a motor and a turbine or a motor and an engine, with one the normal driver and the other a standby in case of power failure or loss of steam supply. This arrangement is most readily applied to double suction pumps, using one driver on each end with a double extended shaft through the pump. The usual practice is to employ clutch or disconnecting type couplings between pump and standby driver.

## Parts Nomenclature

Before delving into any specific application and selection of centrifugal pumps, it is probably well to briefly describe the major parts and their function. Table 4 provides a description of the various parts and their purpose while the typical sectional views, Fig. 7, show the relative arrangement of these various parts in several different basic types of centrifugal pumps.

## Selection by Size of Unit

Preliminary selection of the proper size pump is usually by means of tables or a chart termed a range diagram as it shows how various sizes of pumps collectively cover a wide range of operating conditions. The chart shows areas or zones and with keyed information, indicates the pump size and operating speed which will cover that individual zone of heads and pump capacities. It is only possible to portray one or possibly two choices for each set of head and capacity rating points. These selections must make some assumptions such as choosing by basis of lowest first cost or best efficiency and combined with

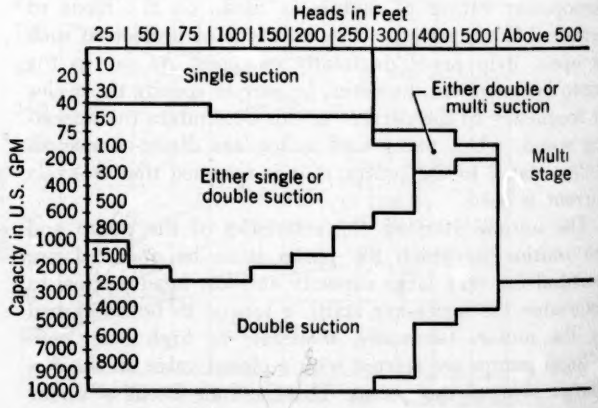

Heads in Feet
25 | 50 | 75 | 100 | 150 | 200 | 250 | 300 | 400 | 500 | Above 500
Capacity in U.S. GPM
20 10 30 40 50 75 100 200 300 400 500 600 800 1000 1500 2000 2500 3000 4000 5000 6000 7000 8000 9000 10000
Single suction
Either double or multi suction
Multi stage
Either single or double suction
Double suction

Fig. 8. Approximate indication of whether single or double suction can apply according to the rating required.

this, some basis as to the pump's permissible suction lift. The usual basis for the latter factor is 15 ft suction lift. Showing each pump's capabilities when pumping with suction lifts up to 15 ft is a universally applied limitation for its individual range.

To actually affirm the selection, it is next necessary to refer to the individual range curves or oak tree curves for the pump considered. Typical examples are Figs. 3, 4 and 5 used earlier in discussing NPSH. Such curves will then tell whether or not the choice is a good one. It is usually advisable to have the rating at a point of capacity at or less than the pumps best point of efficiency and if possible, the rating should require less than the maximum diameter impeller.

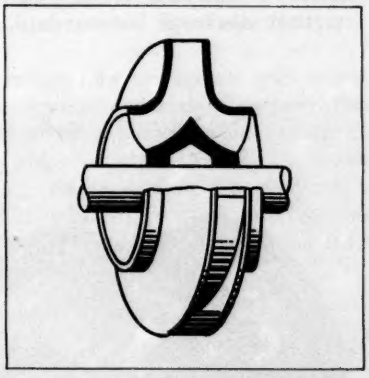
For installations that are completely new, including piping, it is often best to work out the pipe and pump size as a combined project. On clear liquids, the pipe sizes should be large enough to reduce friction to reasonable limits. This is especially important with long runs of pipe on the suction side of the pump. If the fluid transportation job of the pump is really to move solid particles in suspension in a liquid, we then must use pipe that will give us sufficient velocities to keep these solids moving. This varies to such an extent that no typical chart can be generally applied and each case should be investigated on the basis of its own factors.

### Single or Double Suction

One classification of pump types, which can grouped in many ways, is based on impeller type, and single or double suction. Many modifications of both exist. Fig. 8 is an approximate indication of whether a single or double suction pump is indicated according to the rating.

Impellers are classified according to the way the liquid supply comes to the inlet. If the inlet is from one side only, Fig. 9, they are called single suction, and when liquids come to both sides simultaneously, Fig. 10, the impeller is of the double suction type.

Fig. 10. Double suction type.



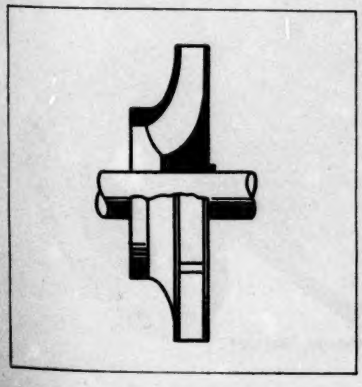
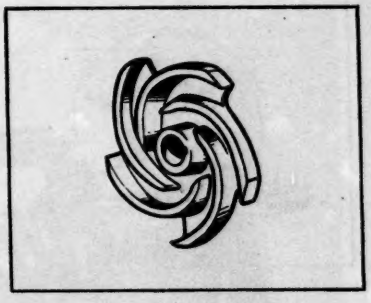


Fig. 9. Single suction—inlet from one side only.

Fig. 12. Open type impeller.



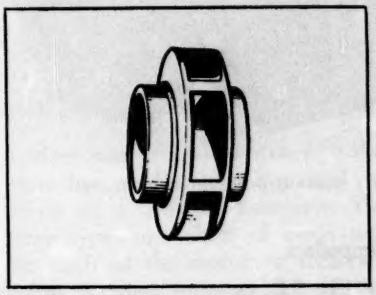


Fig. 11. Enclosed impellers are commonly used.

Actually, of course, the latter is a combination in one casting of two sets of single suction impeller vanes and passages grouped back to back.

In almost all double suction pumps, the casing suction passage enters through one opening which then divides internally into two passageways as the water flows toward the impeller. These two passages, being symmetrical about the impeller centerline, produce equal and opposite flow conditions into both sides of the impeller. The double suction type has two inherent advantages: (1) the equally divided inlet flow means that the impeller operates in nearly perfect axial hydraulic balance so that oversize thrust bearings are unnecessary; (2) because the suction inlet area occurs on both sides, the inlet velocities decrease permitting safe operation with less NPSH than in similarily rated single suction pumps.

Single suction pumps are at an advantage because their design only requires one stuffing box which is often the most troublesome maintenance point in pump operation. They are also more versatile in application arrangement as there usually is a choice of discharge nozzle positions to best suit the installation. Then too, when used as a close coupled pump assembled directly on the motor shaft, they are considerably more compact.

From the manufacturing standpoint, small capacity units of the single suction type are more easily built as the two separated waterways of the double suction design become very narrow and impractical. Many special types of pumps are of the single suction type for the reason that the usual overhung shaft mounting gives no shaft through the impeller eye or inlet. Sewage pumps are a good example as it is desired to give as unobstructed a suction inlet flow as is possible.

Generally, double suction impellers are used in axially split casings and single suction types are restricted to vertically split casings. In multi-stage units, both type impellers are used.

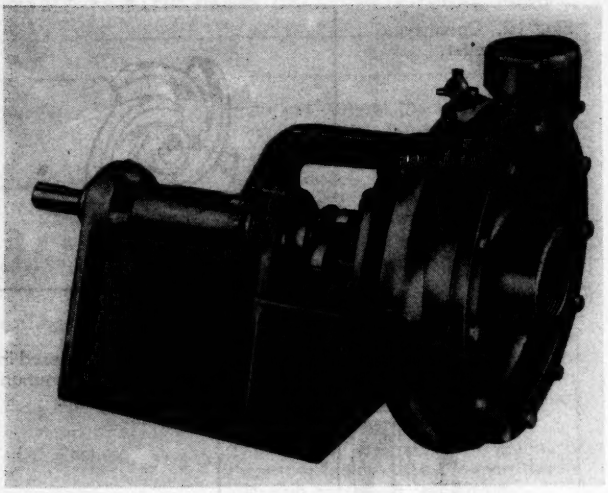


Fig. 13. Single suction pedestal type pump.

### Open or Enclosed Impellers

Enclosed impellers, Fig. 11, are most common and the open type, Fig. 12, or semi-open types are adapted only for special purposes. Generally speaking, enclosed impellers are preferred and will give better hydraulic performance than open impellers, unless one or both of the following conditions exist:

(1) Liquid handled tends to build up as a scale on moving parts.

(2) The liquid contains solids in suspension of comparatively large physical dimensions, but the solids are of such a nature that they will break up when worked upon.

When either or both of these conditions have to be taken into consideration, a pump designed to employ an open impeller should be chosen.

One other reason which may rule out enclosed impellers involves the physical proportions of the impeller castings. Therefore, for the convenience of the manufacturers, open impellers are sometimes the only choice for small capacity pumps. These minimum limits vary somewhat with materials used and with different manufacturers, but roughly, enclosed impellers are usually not made larger than 6 inches in diameter if the opening between sidewalls would be $\frac{1}{8}$ inch; or larger than 12 inches in diameter with $\frac{1}{4}$ inch passage between sidewalls. With wider impellers, open impeller pumps will only show an advantage in possible lower first cost, but the cost of maintenance will definitely be higher and shut downs for maintenance more frequent. Also, overall operating costs increase more rapidly as clearance between open impeller and side plates are usually not adjustable due to the contoured surface along which the impeller runs in close proximity to the plate.

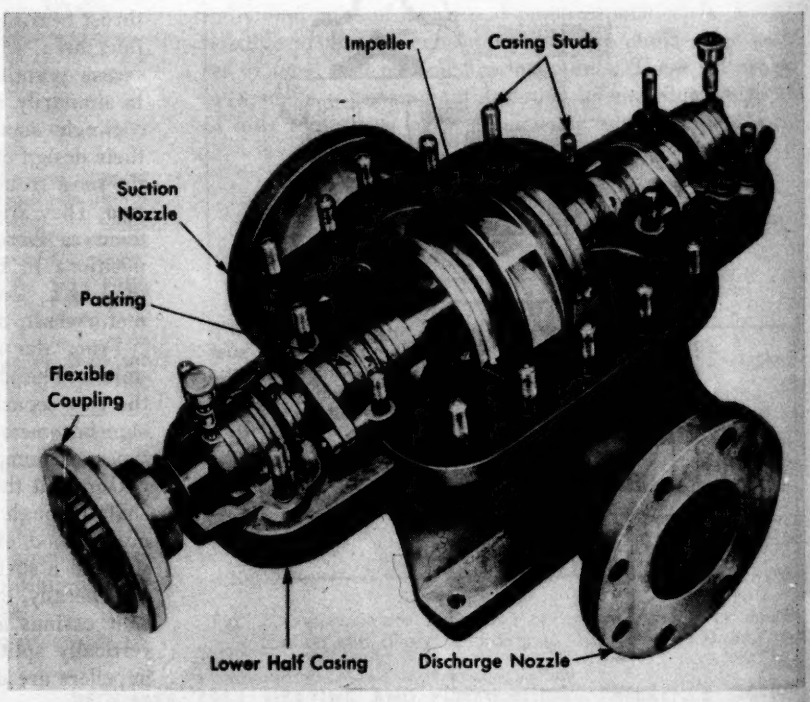
### Ring Clearance

It has long been the practice to use open impellers when any appreciable percentage of solids was in suspension in the liquid, but recently it has been determined that the ability to handle solids lies more in the type of ring clearance than in whether the impeller is of open or enclosed design. Ring fits where the clearance is between two cylindrical surfaces (radial clearance) are not suitable for solids pumping to any degree but pumps having enclosed impellers with end or axial clearance wearing surfaces, can readily handle liquids laden with suspended solids.

### Side or End Suction

The location of the suction and discharge nozzles go hand in hand with the impeller type. The single suction impeller is usually in a casing having end suction, with choice of discharge nozzle position usually based on top vertical discharge as standard. Various alternate dis-

Fig. 14. Double suction, single stage pump with upper half of casing removed to show accessibility of rotating elements.



charge positions are possible. See Fig. 13 which illustrates a single suction pedestal type.

Special types of single suction pumps also may have (1) top suction which is obtained by an elbow extension of the basic end suction design, or (2) side suction in the case where the suction is brought in on the shaft side to keep the stuffing box problem within the limits of the suction pressure conditions.

For medium and large capacities, double suction, single stage pumps are the most common and have nozzles on opposite sides. Often, in larger sizes, bottom suction is also available. Fig. 14 shows a double suction, single stage pump with upper half of casing removed to show complete accessibility of the rotating elements or inside parts.

These pumps are usually designed with symmetrical bearing brackets so that one casing casting can be employed for either direction of rotation. This rotation choice is not obtainable in single suction impeller types unless double sets of right and left hand casing and impeller patterns are made. Therefore, end suction pumps are often limited to only employment of one direction of rotation.

### Horizontal or Vertical Split

The manner in which the casing is split also is based on the impeller type. Double suction pumps, Fig. 14, have horizontally split cases. An advantage is that by removing the upper half, the rotating parts are exposed for inspection and replacement without disturbing either nozzle connection. Single suction impellers, Fig. 13, are used in vertically split cases. With end or top suction, the suction nozzle connection usually has to be disturbed to obtain access to internal parts. Some special larger single end suction types dismantle from the shaft side and provide spacer type couplings to facilitate dismantling. With side single suction, the discharge nozzle becomes the one to be disconnected for inspection and maintenance.

Another factor concerning how casings are split comes into effect in pumps of special materials. Generally, the double suction horizontal split pump casing casting is considerably more expensive in alloys than it is to make the necessary parts for single suction vertically split casing types. When the pumps are to handle special liquids, particularly those where corrosion or abrasion or both are to be combated, the single suction types can more easily be constructed of alloy materials for which machining is difficult.

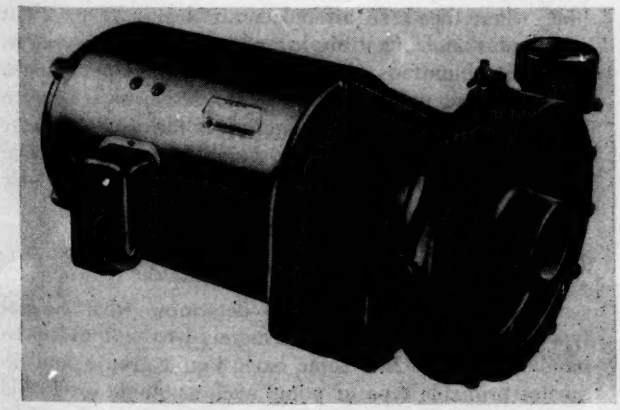
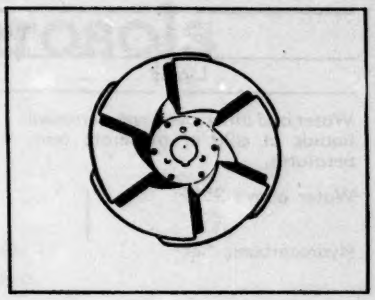


Fig. 15. Closed coupled pump unit with pump parts assembled on motor shaft.

Fig. 17. Mixed flow pump. Available in multi-stage design for high heads.



### Method of Connection to Drivers

Most pumps are connected to their respective driving units by suitable couplings and are mounted with the driver on a common baseplate. The end suction, single stage types are often of close coupled design wherein the shaft of the motor or turbine is extended and the pump is actually assembled on the end of the driving shaft. Fig. 15 shows a close-coupled pump unit with pump parts assembled on the motor shaft. This results in a very compact unit and eliminates most alignment problems encountered with coupled units. In many applications where vertical pumps are preferred, the driving motor is actually installed on the floor above the pump bay and connected to the pump through use of intermediate shafting of the universal joint type. In these applications, it may become necessary that the shafting be supported by intermediate bearings of the pillow block type with the number of bearings determined by the length and diameter of shafting, and horsepower and speed of operation.

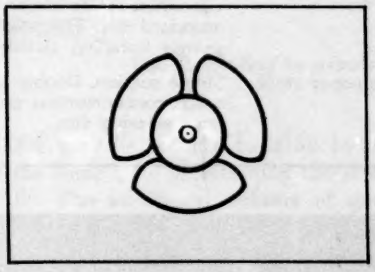


Fig. 16. Basic element of an axial flow pump.

### Single or Multi-stage

Pumps of single stage design predominate. Their limitation lies in the head ratings obtainable and it is usually found that maximum heads for single stage pumps will be between 500 and 600 ft. This will vary somewhat with the capacity rating and with different manufacturers.

Just as single stage units may employ single or double suction impellers, multistage units are also constructed with both types of impellers. The theoretical hydraulic balance of double suction impellers allow their use in any number of stages while the single suction multistage units usually are of an even number of stages with impellers mounted so that end thrust balances out over opposite pairs of impellers. The usual descriptive ter-

**TABLE 5—TYPE SELECTION BASED ON LIQUID HANDLED**

| Liquid | Basic Pump Type | Type Impellers |
|---|---|---|
| Water and other clear non-corrosive liquids at cold or moderate temperatures. | Single or double suction. | Closed except for very small capacities. |
| Water above 250F | Single or double suction. This is usually boiler feed service at high pressures requiring multi-stage pumps. | Closed except for very small capacities. |
| Hydrocarbons, hot | Single suction, often of the special type called refinery pumps, designed particularly for high temperature service. | Closed with large inlets. |
| Corrosives: | | |
| Mildly acid or alkaline | Single or double suction. | Closed except for very small capacities or where liquid tends to form scale on surfaces of moving parts. |
| Strongly acid or alkaline | Single or double suction with single suction probably less expensive if available for the rating. | |
| Hot corrosives | Single suction, with many refinery pump types also used here because of high temperatures and corresponding suction pressures. | |
| Water with Solids in Suspension: Fine abrasives | Single suction with end clearance wearing fits. If all particles pass through ⅛ inch mess screen, rubber lined pumps are available which will give many times the life of metal pumps, providing no chemical action or excessive temperatures will deteriorate the rubber. Special rubber compounds can be applied to improve resistance to certain chemicals. | Open, which allows better application of the rubber, except in larger sizes. Also made in closed type. |
| Coarse abrasives | Single suction. Not available for full range of ratings, that is, small capacities not too easily obtained. Often have very large impellers operated at slow speeds for use when solids larger than 1 inch diameter are the standard diet. This would be of the type called dredge pumps handling sizeable rocks. | Closed. |
| Pulpy solids such as paper stock | Single suction. Double suction only used on very slight solids concentrations and then with special end clearance wearing fits. | Closed. Open type used to be standard but change to end clearance wearing fits made closed impellers better suited. |

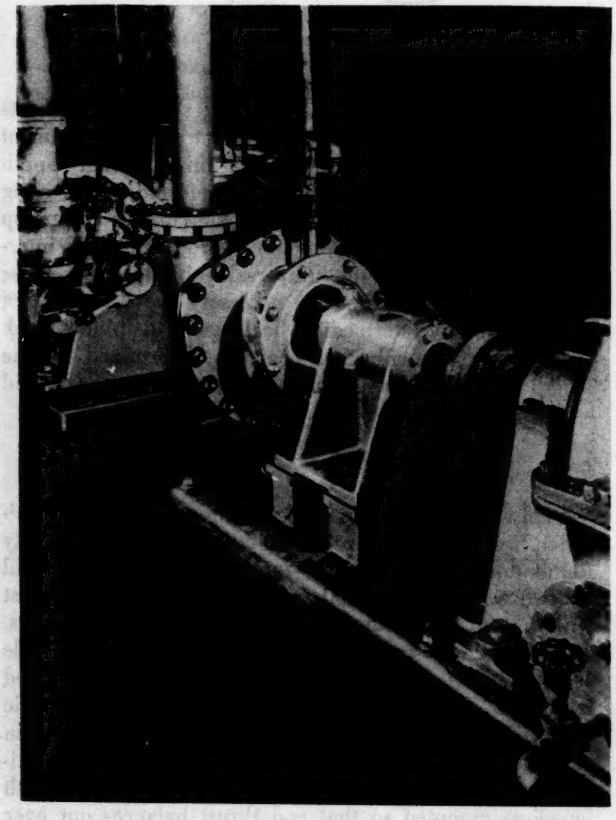


Fig. 18. These 6 x 4-inch pumps are for process work.

minology is that impellers are mounted face to face (suction sides together) or back to back (suction sides opposed). When more than two stages are employed, various combinations can be used.

### Axial and Mixed Flow Pumps

Although not truly centrifugal pumps, the axial and mixed flow types are usually considered in the same general category. Axial flow types are those in which the water flows in a line paralleling the shaft axis. See Fig. 16. Imagine a ship's propeller encased in a stationary tube and you have a good start toward visualizing an axial flow pump. These are used for such jobs as irrigation, power plant condenser circulating water and the like, where head requirements are low (20 to 25 ft maximum) and quantities are proportionally very large, as high as hundreds of thousands of gallons per minute.

Mixed flow pumps, Fig. 17, are somewhere between axial flow and true centrifugal with the same capacity range as axial flow types and in a single stage for heads up to 50 to 75 ft. These mixed flow pumps are also available in multi-stage design for higher heads.

### Type of Unit for Various Liquids

It is also often possible to determine what general types of pumps are applicable merely by the liquid to be handled. Table 5 lists some basic liquid groups and indicates probable type of pump such as single or double suction, and whether closed or open impellers should be applied.

# Bag Filtration of Aerosols

R. T. PRING

American Wheelabrator & Equipment Corp., Mishawaka, Ind.

**This discussion is limited to cloth filtration for the solution of atmospheric pollution problems and excludes applications where plant cleanup or materials-recovery are the primary considerations. The article is based on a panel discussion under chairmanship of the author presented at the 1951 Industrial Hygiene Foundation Engineering Conference.**

FILTRATION is the most efficient means known for the separation of fine particles from gases. Cloth bag houses have been used for generations for dust and fume recovery where gas temperature and moisture content did not exceed tolerance limits for available natural fabrics. The development of new filter materials plus the enactment of more stringent atmospheric pollution codes, particularly in Los Angeles County, California, have focused new interest in cloth bag filtration as a means of reducing the mass rate of emission of contaminants to allowable levels.

Since fume collection problems ordinarily involve handling hot gases, the problem of applying cloth filters to fume-producing operations is largely one of cooling the gases to prevent heat damage to filter fabrics. The following means of cooling are employed, singly, or in various combinations:

(1) Radiation and convection cooling (requires large capital investment when used alone).
(2) Evaporative cooling (requires careful control to avoid condensation).
(3) Admission of tempering air (increases total volume of gas to be filtered).

Radiation cooling with the conventional U-tube condensers is effective for high temperature where $T_1$—$T_2$ is large. Heat transfer rates vary from 5 Btu per (hr) (sq ft) (F) for HR stainless steel in the range of 1600F to 0.5 Btu per (hr) (sq ft) (F) through carbon steel at lower values of $T_1$—$T_2$. Convection cooling employs forced-draft tubular heat exchangers where cool air is forced around the tubes through which hot contaminated gases pass enroute to the filter (Fig. 1). Net volumes and dew points are lowest with radiation and convection cooling.

Evaporative cooling (Fig. 2) involves the complete evaporation of water spray by the contaminated gases. With proper controls, initial gas temperatures above

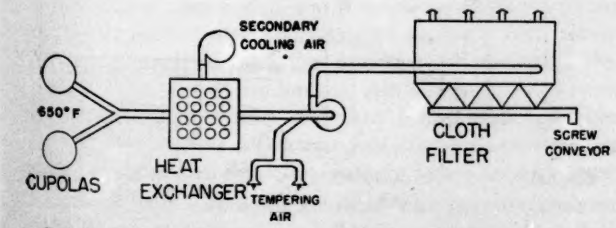



Fig. 1. Gas cooling by heat exchanger and tempering air.

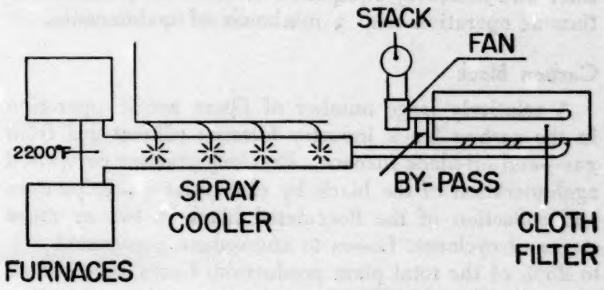



Fig. 2. Cooling by evaporation.

2000F may be reduced to 275F by evaporative cooling, at the same time maintaining the dew point at less than 200F. The additional volume of gas to be filtered by reason of the added cooling water vapor is nominal.

The admission of tempering air as a means of cooling hot gases is widely used where the initial moisture content of the gas is high. Its only disadvantage lies in the high resultant volume to be filtered, requiring excessively large collectors and accessory equipment.

Several years of operating experience in hot filtration has been obtained by American Wheelabrator utilizing Dustubes fabricated from Du Pont's Orlon (R) acrylic fiber for temperatures not exceeding 275F. In the following are described a number of key installations which are of interest from the viewpoint of atmospheric pollution control.

The examples of hot filtration given in this discussion indicate that where high efficiency is desirable or necessary in the removal of solid particles from hot gases,

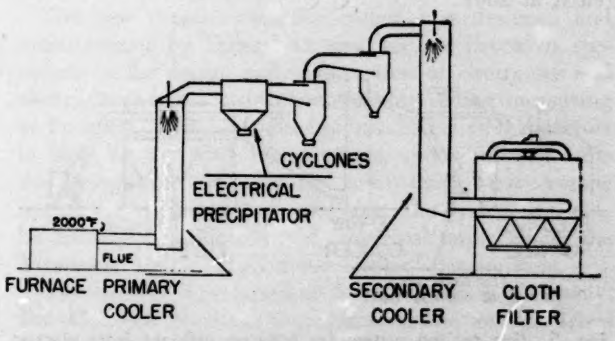



Fig. 3. Carbon black filtration system.

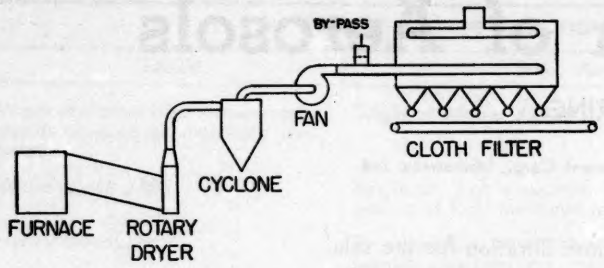



Fig. 4. Asbestos rock drying installation.

filtration is definitely feasible. The success of such an installation depends largely on the degree of accuracy with which operating conditions can be determined or estimated and the pains taken in the design of the cloth filter and accessory equipment in order to provide continuous operation with a minimum of maintenance.

### Carbon Black

A relatively large number of filters are in operation in the carbon black industry filtering effluent gas from gas—and oil-black furnaces. Previous practice comprised agglomeration of the black by electrostatic precipitators and collection of the flocculated black in two or more stages of cyclones. Losses to atmosphere constituted 5% to 25% of the total plant production. Gases were cooled from 2000F to 450F in quenchers or primary cooling towers ahead of the precipitators.

The accompanying flow sheet (Fig. 3) illustrates a typical application of cloth bag filtration to clean effluent-gas from two stages of cyclones in series. The gases enter a secondary spray cooler at 450F, are cooled to the filtration temperature and drawn through a Dustube collector having eight compartments with Orlon cloth. Measured gas volume at the filter is 55,000 cfm containing roughly 6000 lb carbon black per 24 hours. The filtered gas contains no visible solids.

### Oil-fired Rock Driers

Control of the process can frequently be used to control filtration temperature as evidenced by an operating installation at Vermont Asbestos Mines Div., The Ruberoid Co. Two oil-fired rotary driers are exhausted through cyclones and the gas containing fine dust and water vapor blow through a 5-compartment collector clothed with Orlon filter bags (Fig. 4). The filtration temperature is 250F and only an automatic bypass is required to protect against temperature surges. The gas volume is 39,140 cfm containing 0.895 grains solids per cu ft at 250F.

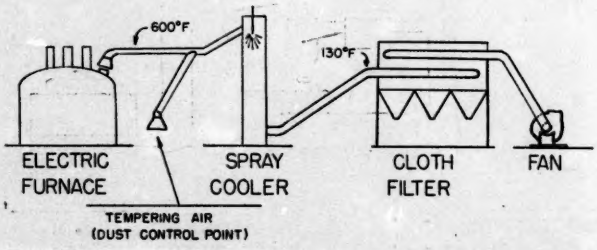



Fig. 5. Gas cooling system for filtering effluent from electric casting furnace.

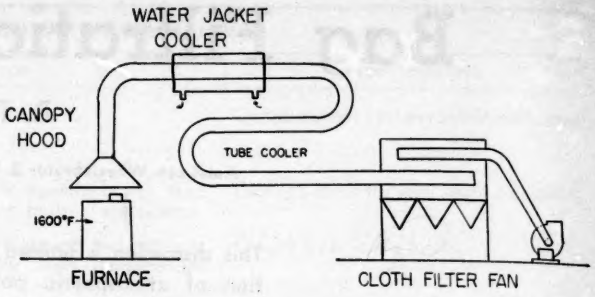



Fig. 6. Gas cooling and filtering system for reverberatory brass furnace, using water jacket and tube surface for cooling.

### Electric Copper Casting Furnace

The utilization of room air from dust control points is an important factor in cooling 600F gas from a 50-ton electric copper casting furnace at a large eastern copper refinery. A relatively small volume of gas is exhausted from the furnace (Fig. 5), mixed with tempering air and further cooled in a cyclonic spray chamber to a filtration temperature of 130F. The filter is a two-compartment American Dustube with cotton cloth. The design volume is 3800 cfm at 100F containing 15 lb per hr of fine copper fume.

### Brass Refining Furnace

Infiltrated air plus radiation and convection are utilized at Consumers Metal Co. in cooling gas from an oil-fired reverberatory brass furnace. Furnace gases at 1600F are mixed with room air at the overhead hood (Fig. 6), and further cooled in a water-jacketed section of duct. Additional cooling to 225F is effected by radiation from an extended duct system. The collector is a 4-compartment American Dustube. While Nylon was used originally, the present commercial availability of Orlon fabric has influenced this metal refining company to change over to Orlon cloth. The gas volume is 12,000 cfm.

### Iron Foundry Cupola

In a cupola gas filtration system at a Los Angeles iron foundry, gases at an estimated peak temperature of 1950F will pass through a short stainless steel duct to a quencher where the temperature will be reduced to and controlled at 450F (Fig. 7). A secondary spray

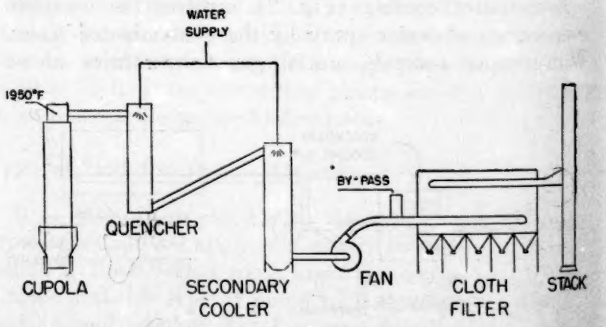



Fig. 7. Stack gas filtration system at an iron foundry cupola.

cooler will carry the gas from 450F to the filtration temperature. The filter is a 5-compartment collector equipped with Orlon filter cloth.

### Rock Wool Cupolas

A. E. Rathgeb, chief dust control engineer, Johns-Manville Corp., described how, at Watson, Los Angeles County, his company operates two cupolas in which smelter slag is melted down with coke preliminary to blowing the melt to form insulating material. To comply with county atmospheric pollution code, a collector has recently been placed in operation.

In the flow sheet (Fig. 1), cupola gases are drawn off either of two cupolas at peak temperatures of 650F. Main cooling is by forced draft heat exchanger with automatic tempering air inlets to control temperature surges. Average temperature at the bag filter is 225F.

Filter tubes are fabricated from Orlon and the filtered air contains no visible solids.

A 4-compartment collector is used, and the design volume is 14,000 cfm at 225F containing 100 lb per hr of solids.

### Secondary Lead Smelting

E. J. Langan of Toronto Refiners & Smelters, Ltd., told how, although a reputable agency reported that fumes from two oil-fired lead reverberatory furnaces contained no lead, a dust collection system was installed to alleviate an air pollution condition.

Cooling is by water sprays installed in a horizontal brick flue. In the flow sheet (Fig. 2), gases at 2200F leave the reverberatory furnace, are cooled by sprays to 350F and by radiation to the filtration temperature. A by-pass, automatically controlled, protects the filter from temperature surges or failure of control instruments. After the system was placed in operation, it was found that between $300 and $600 per day was realized in collected lead oxide.

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## City of New York Installs System for CO Control in a Bus Garage

A new type of carbon monoxide detector has been installed in New York City's huge municipal bus garage and maintenance center, said to be the world's largest bus garage. The apparatus is also being adopted widely for carbon monoxide detection and control in automotive depots and shops, vehicular tunnels, underground parking stations and similar areas where concentration of toxic gases creates a safety engineering problem.

New York's mammoth bus facility was planned by and built under the supervision of the city's Board of Transportation, which operates the depot. With a floor area of over 13 acres, it can accommodate more than 3,000 buses. The ground floor is used for storage, servicing and minor repair work, a second floor is devoted to complete reconditioning shops, and a top floor is given over to administration and engineering quarters, control facilities, classroom and the like.

The system is completely automatic. It conducts continuous sampling and chemical analysis of air pumped from various areas in the depot, sounds an alarm when any analysis shows undue concentration of carbon monoxide, and keeps a permanent record of analysis results for future reference.

Air intake tubes installed at forty-two points throughout the depot lead to a centrally-located analyzer unit, where the air is analyzed and the detector and recording elements of the system are housed. Air is drawn by vacuum pump through the tube and into a cartridge air filter and charcoal tower which removes contaminants such as dust, suspended oil particles, hydrocarbons and acid gases.

A controlled volume of air then flows into the analyzer cell where the carbon monoxide is converted to carbon dioxide. Heat generated in this reaction is proportional to the concentration of CO in the sample. This heat generates a voltage in a thermopile which is converted into a measurement of CO concentraton in parts per ten thousand by a potentiometric recorder. Visual indication of the measurement and a continuous graphic record is provided, and fan controls may be operated.

This method circumvents the masking effect which the presence of water vapor in the air may have on the accuracy of carbon monoxide analysis by other methods. It also eliminates the handicap imposed by use of air driers.

The new detector-recorder registers variations as small as five parts CO per million parts of air. When the depot was built, it was equipped with a giant ventilating system with a blower output of 1,437,950 cfm. This permits an air change every six minutes in the three million cubic-foot garage area on the first floor, every 12 minutes in the lower ceiling area and every 20 minutes in the higher-ceiling area of the second floor, and every 8 minutes in offices and classrooms.

The new detector-recorder system was designed and manufactured by Taller & Cooper, Inc., of Brooklyn, specialists in the design and construction of electronics and electro-mechanical instrumentation for testing measuring and control. They have already installed similar detectors in New York's 179th Street tunnel, and additional units are being fabricated for the newly-built First Avenue tunnel under United Nations Plaza. The system will also be installed in Caracas's new municipal tunnel under the Venezuelan city's "Rockefeller Center" development.

The system was installed by Michaels & Company, Brooklyn firm of electrical contractors, who were electrical contractors for the depot.

# What's New That's Unusual

## Items of Interest Relating to Heating, Ventilating and Snow Melting

T. W. REYNOLDS

**A review of trends and things new or unusual that has been announced during the past few years.**

WARM air furnaces are often found with all or part of the filters temporarily or permanently removed. In such cases blower wheels are apt to become coated with oil which builds up dust to where the wheel is thrown out of balance and vibrations then result. Incidentally, one way to help out filters in the industrial plant is to fit the usual lift truck with a sweeper and spray system. In the residence, dust can be kept down by spraying the coal bin and its remaining coal just before delivering the coal.

Electrostatic filters that take current have been extended to the home and the precipitator that stops oil mist is now widely used in industrial plants. One architect recommends electrostatic filters in doorway floor grilles of stores to de-dust customers before they enter. Recently certain plastics were observed to be dust catchers, but this annoyance was soon put to good use to produce a filter that operates on the electrostatic principle, except that it is self charging due to the flow of air through it.

### Refrigeration

Refrigeration of today covers a multitude of applications from the freezing of horsemeat for dogs to human bones for surgical use; from an ice cube maker that provides circular shaped solid ice cubes to better fit circular glasses, to cakes which thaw out on the way to the purchaser. Frozen food lockers are now proposed for basements of apartment houses and any residence can have a portable plug in bar on casters with cooler for drinks and ice cubes. What people are thinking about when they buy a refrigerator is disclosed by Allen Funts Candid Camera in a recent film for the Nash-Kelvinator Corp.

The skating rink in Chicago's Conrad Hilton Hotel, Fig. 1, is quite a departure from the usual in that it is built on a hydraulic lift for lowering when required to make way for the dance floor. The master floor of the rink is of cork covered with a waterproof membrane, and tubing is of light steel with sand only half way between the tubing instead of complete coverage, while the ice is made thin as possible, all of which keeps down the weight.

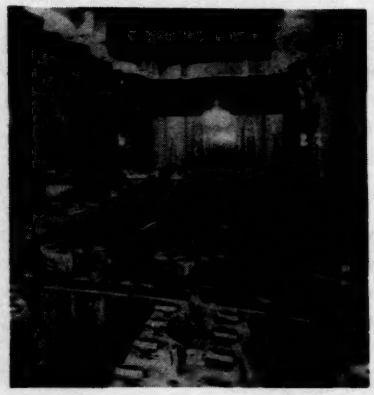


Fig. 1. Tables set around ice skating rink, Conrad Hilton Hotel, Chicago.

In the construction of dams, refrigeration has been used to freeze earth banks to prevent sliding and to remove the heat generated in mass concrete, as caused by its great weight and the reactions of lime and other ingredients. Temperature, otherwise, would build up to crack the concrete. Sometimes the concrete mix is pre-chilled with ice cubes or ribbons. A huge dam requires a lot of buried chilled water piping and a dam may take two years to cool down.

### Odors

Various means are being employed to remove odors or the perception of odors. Perhaps the advertiser of odor removers might produce a more effective appeal by calling them smell removers. My own first impressions were made in the country, where the fragrance of flowers were called odors while smell was related to the horse barn and the gravity outhouse.

Seriously, however, there is more to this matter of early impressions than would appear offhand. Psychologists say that a childhood spent near wharves makes fish a pleasant odor in later life while the smell from a railroad tie creosoting plant unfamiliar in early life would always remain offensive. Likes and dislikes as to odors and smells could well reverse for some others with childhood environments in reverse, much the same as happens in the case of colors. Anything wrapped in yellow is not apt to sell in South America where the yellow flag used to hang out when yellow fever was prevalent.

The smell of lysol may envision clean linen and polished hospital floors, but the recollections of someone else may be of a bad place that certainly needs disinfecting. Smells or odors also produce different reactions at different times and places, just as lavender in soup is not the same as in soap. A moderate use of garlic in food may be stimulating, but not in the subway.

Perfume no longer excites me, but the odor from coffee roasting plants and the fish market in downtown New York is agreeable to me, although not to some persons I know. The most distinctive smell I ever encountered was brief but powerful as I passed on the street a window exhaust fan in a glue factory at Little Falls, N. Y. Although this happened years ago, I have never forgotten it, nor

the fact that a local resident claimed to enjoy it. Curiously enough, smells that are offensive are seldom toxic.

The study of odors has become a science in itself and has resulted in many methods of meeting the problem. There are counteractors to suit the odor to be neutralized, deodorizers applied to room air conditioners to eliminate odors and reduce outdoor air requirements, and an electric bulb that explodes odor molecules and makes ozone. Activated carbon air purifiers are, of course, widely used for odor elimination in offices, restaurants, lavatories, hotels, theaters and many other places. A number of surgeons now say they have no objection to the use of reconditioned air in hospital operating rooms. They say it does not increase the chances of infection.

Recently a type of filter has been produced for use in air conditioning systems to remove odors by means of a liquid solution impregnated on the throw away type or sprayed on the permanent type. It is said that odors are trapped in the filter in the same way as the dust is collected.

### Ventilation

Laboratory hoods have been great users and wasters of conditioned air. As a consequence, an induction hood, Fig. 2, is now made that will operate more efficiently and it is said with 25% of the conditioned air required by

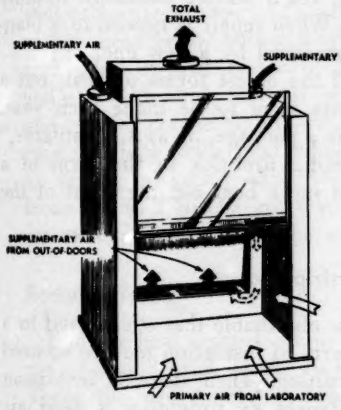



Fig. 2. Design features of an induction type of laboratory hood.

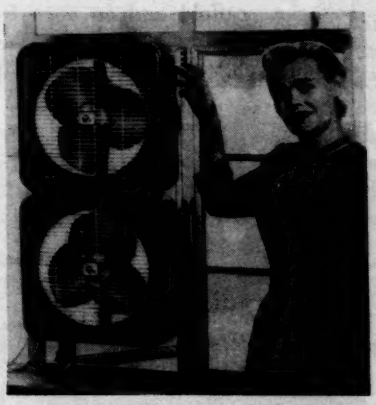
the usual hood. It is arranged to take out only what is supplied by the air conditioning system, the balance being taken directly from outdoors.

You can get about anything in window ventilators today. A two-fan arrangement, Fig. 3, mounted together may be obtained that will take the width of window sash. There are also window ventilators with variable speed motor to supply or exhaust, or so introduce the air that it will be tempered by mixture with hot air at the ceiling. Natural ventilation of structures has also been greatly improved. Small building models of various size and arrangement are used to predetermine the effect. In connection with ventilation it should also be mentioned that smoke containers for tracing air flow and air leaks are available in three colors.

### Fans

Horizontal fans have been developed primarily for low headroom in attics; fans for use outdoors with weatherproof hood over the motor; fans for the bedroom automatically controlled to stop when the temperature drops too low for comfort; exhaust fans for the bath, that stop after a period as set for the usual dampness and odors.

Fig. 3. Two-fan arrangement for a window ventilator.



A floor fan has been designed to avoid dust pick-up and floor draft, also an exhaust fan which may be fastened to the outside of the house at the top half of the window below the awning. This fan removes heat from the house and incidentally the awning.

Draft boosters may be provided for various oil-fired devices, such as furnaces and heaters for the house and for domestic hot water. The warm air furnace can have a rotating fan in the furnace hood, or a booster fan in each cold air return duct, or a new blower control which graduates by an air vane the circulation of warm air according to the amount of heat in the furnace bonnet. This provides more even heat and reduces floor to ceiling temperature differences.

Lexington, Va. does not permit the autumn leaves to be burned where they fall, so leaves are raked by the house owners out into the street. This presented quite a street cleaning problem until an exhaust fan with gas engine drive was mounted on a trailer. To the fan a connection of stove pipe was made and the open end kept about 12 inches above the pavement.

A direct-fired heater now has variable pitch sheaves on the fan. This makes a flexible arrangement for seasonal requirements in heating, air conditioning and ventilating systems and enables one to balance static pressures and velocities within ducts.

### Paint and Spray Booths

A recently developed unit for paint spray booths provides warm air make-up for the air intermittently exhausted, thus eliminating negative pressures with consequent drafts, dust, and inefficient operation of the blower. Paint arrestors may also be obtained for removing overspray from the spray booth exhaust system.

As for paint used for various other purposes, there is a paint that is odorless and another that is multi-color which produces a spatter finish of two or more colors with a single coat. This paint may be obtained in various color combinations. Then there is a paint which is said to be a rust preventative even when applied over rust. It penetrates a rust layer to seal the surface against further rusting.

### Unusual Applications of Heating

Applications of radiant heating and snow melting

systems have been extended to unusual places and unusual conditions. Various methods of heating will also be found in unexpected places, such as a grandstand, tent, box car, scaffold and an open front store. The tent in mind is heated by a direct fired heater with attached fuel oil tank; on warmer days the unit ventilates.

Fig. 4. Pipes to warm feet of spectators.

Pipes under the bleachers of a grandstand in Phoenix, Arizona, warm the feet and ankles of the occupants. Special piping, Fig. 4, was placed for those in the boxes at this grandstand. A covered scaffold on a building in Portland, Oregon, had heating pipes run along the rail to convectors with pipes connected through a flexible hose to a source of steam. The main purpose of heating was to prevent the overnight freezing of the facing mortar in ceramic veneer when first applied on the exterior building walls.

A tarpaulin roof, with rented gas unit heaters below, kept the artists' fingers nimble in constructing the interior display of the Perisphere at the World's Fair, Flushing, N. Y. In another application of unit heaters, Fig. 5, a box car and the canvassed passageway to the car across the loading platform were heated through a short duct extension. Such arrangement keeps the loaders comfortable and eliminates any temperature shock on the body, as would otherwise be occasioned by intermittent exposure to indoor and outdoor temperatures.

A market in Los Angeles has a full open front across its width, nevertheless it is satisfactorily heated by a blower

Fig. 5. Arrangement to heat a railroad box car.

even against a northerly wind which cannot enter against the blower pressure. Heating of trailers with oil heaters may not be unusual, but sun motors still are. One is now being demonstrated merely to show what science is thinking about.

Heating and air conditioning of the parking lot office is becoming quite the thing, but an installation in a parking lot at Oklahoma City to keep bus and truck motor

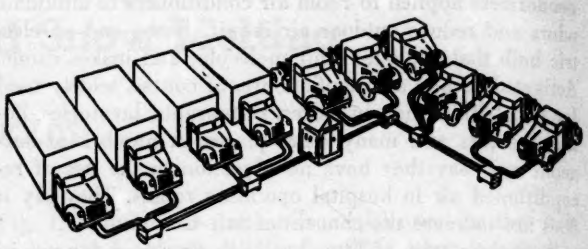


Fig. 6. Plan to keep bus and truck motors warm.

blocks from freezing, Fig. 6, is a new idea. Here a portable oil-fired heater with hot water circulator and easily made hose connections to motor blocks takes care of a maximum of 20 motors. The operating cost is less than the cost of gas for idling motors.

In the Columbia River power area over 500 dwellings are heated by an electric cable at a cost of 8 to 11 cents per square foot of heated surface per year. Another form of electric heating, one which may be termed local heating, is the electric blanket. While this blanket in itself is no longer a news item, yet a service exchange recently instituted is of interest. When repair is needed to a blanket it is returned and replaced by a new one.

Fireplaces are one of the oldest forms of heat, but a number of improvements seem to be made each year. They can be obtained as a package, or as a "heatilator," or installed with insulating firebrick in the form of a reflective shield to send more heat out the front of the fireplace.

### Insulation and Weatherstripping

Pipe insulation is now obtainable that sticks itself to a pipe or duct. Another form of insulation may be secured by clips to prevent crushing. Then there is insulation that by-passes duct stiffeners by providing a dead air space.

Glass doors in stores can be insulated to eliminate drafts, dust, and air hum. For the more usual door in the residence there is a device of metal and insulating felt that seals the bottom of the door when closed. This sealing device raises as the door opens to avoid rubbing of the felt or rug.

### Radiators and Unit Heaters

The unit heater will be found back on the farm in the milk house, brooder house and work shop and where it also provides air circulation in the summer months. In the case of industrial plants, it may be found most anywhere, but its use as a standard part of a machine is new. The drying sections of a plating machine is now so arranged.

A gas-fired forced convection heater with diffuser rings is available for use at the ceiling. It is particularly suited for stores, shop and gas stations. Fin radiation can now be obtained in the slant type, Fig. 7, and also in a type where you clip the fins on the pipe yourself to form any

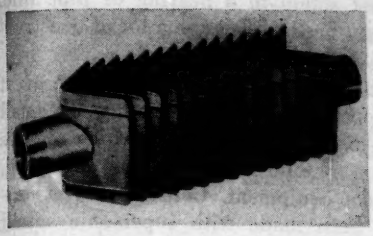


Fig. 7. Slant type fin radiation.

length of baseboard radiation desired. Electrically heated baseboards are finding wider use. Some of their advantages are absence of chimney, noise, pick-up and standby boiler losses. As for the ordinary radiator, one can obtain a radiator shield and enclosure which among other advantages contains a dust gutter to catch most of the dust in the passing air.

There are sill type radiators to replace window sills; high baseboard radiation for additional load effect; low level convectors for picture windows; and baseboard radiation for installation at ceiling level where floor area is not available. Such is often the case in kitchens and in warehouses where goods at floor level would obstruct heating, or become damaged by any hot contact, or whenever goods of a perishable nature must be kept cool.

Heating of the picture window with convectors, Fig. 8, can be arranged with (1) a convector above the floor with top or front grille and with warm air convector discharge contacting the window; (2) with the convector at ceiling of basement below taking return air from the basement and with floor grille and warm air contacting the window; and (3) with the convector below with two floor grilles and cool air contacting the window. In the last mentioned case the floor grille next to the wall passes cool return air to the convector while the adjacent floor grille out from the wall discharges warm air to blanket the cool air return coming down the window.

## Radiant Heat

Radiant heat started off in very early days with the use of heated brick or flat iron in bed as a bed warmer. Today the heated flat iron is the radiant heated floor of the garage and cold storage room, or the local application of an electric mat to keep the feet warm.

From the floor and ceiling, radiant heat has progressed to the radiant heated bath tub with coils placed in the hollow space behind the apron of the tub, the radiant electrically heated picture on the wall where it contacts no drapes or the person, and the radiant heated platter to keep food hot. Despite the many applications, radiant heat being invisible, is not well understood by the layman, so one contractor cut a hole in his office floor to show the radiant heating pipes, or as he says, "to show where the indoor sun comes from." The hole is covered flush with a glass panel.

Studies are being made on the installation of pipes in the soil below plow depth to force crops ahead of the season. Natural warm water wells in Iceland have been used for the same purpose or so-called heat irrigation. Of late, a densifier for concrete floor slab has been developed to increase the heat transfer of the slab in radiant heating. It is said to save about 30% of the pipe formerly required and that only 10% of the savings go into the cost of the product.

## Hot Spots

In the industrial plant there are many cases where radiant heat from some process is unwanted, being so great that spot cooling or other attempted relief does not solve the problem. To meet these situations, screens have been developed to reflect the radiant heat, such as screens with aluminum foil and tin plate fastened to wood frames. Other screens as lately developed make use of highly absorbent materials which convert much of the radiant heat into convected heat. There are also heat absorbing screens that are water cooled. Screens of wire mesh are of course required where visibility is necessary to the process.

## Snow Melting

Combating nature during the winter months has brought about a number of methods of snow and ice melting and removal, as well as various methods of preventing freezing. In South Bend, Ind., an auto laundry directs air from warm air ducts over automobiles to free them of ice and snow and to dry the cars quickly after washing. In the Brooklyn Jewish Home, at Far Rockaway, N. Y., a snow melting and radiant heating system keeps the terrace free from snow for its convalescents and at all times of use keeps the residents' feet warm.

Out in Minneapolis where the snow falls heavy and temperatures are low, a manufacturer has developed a snow blower that clears a ton of snow per minute and blows the snow 65 ft in any direction. Those who sell road tar display photographs of black roads free of snow with cross roads of other material covered with snow. In addition, the black roads are not affected by chemicals used to melt snow.

Black roads are in truth self melters of snow for not too heavy a fall, and after the snow plow has passed, they more quickly melt what remains. For example, the heat-

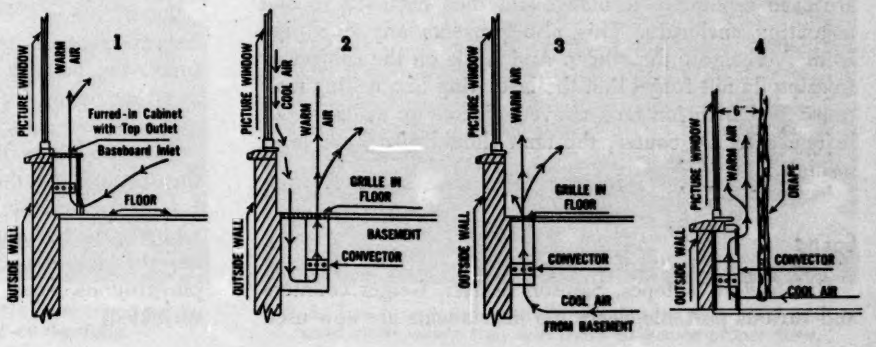



Fig. 8. Methods of using convectors to heat picture windows. (1) Convector element furred in by a false wall that forms convector stack. (2) Convector element fitted into a sheet metal box below floor. (3) Wall-hung convector with top outlet suspended in basement. (4) Installation of a semi-recessed convector.

absorbing qualities of a cinder road to my former home maintained the ground below at temperatures usually above freezing and as a consequence wind blown seeds of the petunia sent forth early blooms.

A long run of water supply pipe in the road to the house only 18 inches below on rock never froze up. Nevertheless, a snow melting system would have done a better job for that road and insured a greater protection of the water supply pipe. Where rock is encountered it would seem that a heating pipe accompanying a water main would be less expensive than going down with the water main to a depth below the frost line. Heat would not need to be applied until near spring when the frost line has gradually deepened.

### Freeze Prevention

Flexible electric cable is coming into considerable use for the thawing out of gutters, leaders, roof drains and the melting of snow on roofs to prevent formation of destructive snow slides. The cable is also used in the asphalt or concrete at doorways, steps and sidewalks and in the ground for faster seed germination and plant growth.

During three years of appraisal work in railroad yards I often wished that I had an easy way of raising manhole covers, particularly so when frozen so tight that a fire had to be built over them. On cold frosty mornings these covers over meters, valves, steam traps, and vaults, seemed to grow in number. Today one can obtain a manhole cover that is counterweighted for easy opening.

Snow and ice melting has been extended to TV aerials, but electrical transmission lines do their own melting by the simple routing of artificial loads which heat up the lines. Floor drains are now obtainable for use in revolving doors at stores, although snow melting systems would insure less tracking in of snow and the accompanying dirt. Incidentally, in some recent snow melting installations, the sole heat transfer medium is oil.

The sides of the coal cars are sprayed today with oil before loading to keep wet coal from freezing. The coal is likewise sprayed. This method of freeze prevention could be applied to barges, stock piles and silos. A way may be found to safely defrost store windows by electricity as is already done in an experimental house. In this house the glass has a metallic oxide coating which conducts currents at usual voltages to provide radiant heat for overcoming the usual cold window effect on persons near the window.

One of the best ways of preventing process lines from freezing is a method used in a chemical company at Niagara Falls. The design is that instead of enclosing three different bare pipes in one insulating wrapper they are each separately insulated and then enclosed in one insulating enclosure. This also prevents any one pipe from overheating the others. And while on the subject of freezing do not forget that the insulating of a ceiling may cause the expansion tank above to freeze up as happened in one case. Of course, the tank should also have been insulated.

### Sound

Radioactive isotopes, Samson heaters, Geiger counters and various portable electronic instruments are now used to locate the slightest sound in a bearing or pipe line. There is no longer any need to damage a lot of construction to find a leak.

Ultrasonic or high frequency sound waves have great possibilities. One application is the cleaning of small parts. One apparatus produces sonic waves which remove and prevent formation of solid limestone crust in piping, or in boilers and like equipment. Considerable experimentation, has also been made with supersonic sound waves, which, incidentally, the human ear cannot detect, to bring small smoke particles together into one of larger size which can be separated out for dust filtration.

There are spray materials which are said will eliminate noise and at the same time insulate and fireproof. Cooling towers have been thoroughly soundproofed in recent installations by means of various acoustical housings, covers and baffles. The towers have also been dressed up with aluminum exteriors to reflect sun. All dissimilar metals about the towers are electrically insulated.

The general noise level seems to be rising despite acoustical treatment, because machines have more power and speed and there are more of them crowded in a given area. So there are various space absorbers which you can hang from the ceiling, such as spheres, cubes, cylinders and pyramids to provide a shape which gives a maximum of surface for sound absorption. These are helpful, but I have seen some spaces so noiseless that they seemed dead, or else made noticeable other noises farther away.

### Air Pollution

Air is essential for breathing and combustion; for use as a heating medium; for use with compressed air tools; in an expansion tank; or the basis of a water hammer cushion. It can stop steam or hot water heat circulation and can collect a lot of germs, odors and dirt. The very draft that helps the boiler fire pollutes the atmosphere. So we take the bad with the good and try to do something about the bad. Thus, we recover various products from flue gas as in England where experiments now being made recover 95% of the sulfur in the flue gas. The hitch, however, is that the coal only contains an average sulfur content of 1.5%. Nevertheless, the pollution of the atmosphere is thereby reduced.

In New York City there are many who blame the Consolidated Edison Company for the discoloration of walls of the UN structure not far away. Yet the power house of the Consolidated Edison was there first, about 50 years before the UN structure, the top of which unfortunately was made a bit higher than the stacks of the power house. The utility finds that complete elimination of offensible products from their stacks is not practical and has already spent in the last 15 years about twenty millions of dollars for the best of new collecting devices and improvement of its older devices. Most people seem to forget the balance of the city uses twice as much fuel and that winds from New Jersey bring in some of the objectionable soot.

In other cities it has been discovered that much of the dust and dirt comes from junk yards and auto wrecking companies, bonfires, city dumps, incinerators, automobiles, the burning of steel drums as a cleaning process, and the lack of paving in alleys, public parking lots and playgrounds. Some parking lots are now required to be sprinkled.

# Joining Copper Tube and Soldered Fittings

DOREMUS L. MILLS

Research Department, Revere Copper and Brass Incorporated

**A procedure is outlined for the proper making of soft soldered joints between copper tube and fittings that are strong enough to withstand stresses that might occur in most domestic piping systems. A sequence of illustrations demonstrates the seven steps employed in this method.**

PROBABLY the most common type of fittings used with copper tube is the soldered type using soft solder, preferably composed of equal parts of tin and lead. Joints of this kind must serve copper tube for water distributing purposes and other rural and domestic systems in many parts of the country for long periods of time. The strength of these soft soldered joints must be adequate for any stresses that might occur.

Fig. 1. The tube is cut to the exact length required with a saw or cutting wheel. Guide is used to ensure a square cut.

Industrial practice and research have developed technics for properly joining copper tube and fittings. When these technics are applied to soft soldered joints it is found that the tensile strength of the joint is greater than that of the copper iself. This is borne out by extensive investigations relating to the strength of soft soldered joints made by the Bureau of Standards in Washington. A report designated as BMS 58 entitled, "Strength of Soft Soldered Joints in Copper Tube" has been published.

One procedure for making soft soldered joints with copper tube that has given the desired results will be described in sequence and illustrated in Fig. 1 through Fig. 7.

### Steps

(1) First the tube must be cut off square so that the cut end will seat properly in the socket of the fitting.

(2) The burrs and slivers remaining after cutting must be removed by filing the inside and outside edges of the tube.

Fig. 2. All burrs and slivers left by cutting are removed by filing both the inside and outside of the tube.

Fig. 3. The fitting and the tube are cleaned with steel wool or sand cloth where they will mate to insure proper flow.

Fig. 4. Flux is applied by a brush to the outside of the tube and the inside of the fitting, covering the socket completely.

Fig. 5. The tube and fitting are assembled and heated to the correct soldering temperature with the torch.

(3) The inside surface of the socket of the fitting and the outside surface of the tube equal to the depth of the socket must be thoroughly cleaned with steel wool, sand paper, or emery cloth.

(4) Soldering paste of a noncorroding type must be applied to the inside of the socket and the outside surface of the tube end that has just been cleaned. This flux is applied by brush.

(5) The tube can then be inserted in the fitting. It is advisable to give it a couple of quarter turns to assure even distribution of the flux. The flame of the torch is first applied to the tube near the fitting. Then it is concentrated near the base of the joint in order to draw the solder completely into the base of the socket in the fitting. The torch should be kept moving, and when the flux begins to boil it is an indication that the fitting has nearly reached the proper temperature for soldering.

(6) The flame of the torch should then be removed. If the fitting is at the proper temperature the solder, when applied at the face of the fitting, will be drawn into the joint. More solder should be fed into the joint until a solder ring appears completely around the end of the fitting where the tube enters. Care should be taken not to apply too much solder in order to produce a neat appearing joint.

(7) When using the type of fitting which has a feed hole for the solder and a groove inside, the procedure is just the same, except that the solder is fed into the feed hole until the ring appears at the edge of the fitting. The hole must be kept full of solder.

The steps of the procedure are followed in sequence in the illustrations.

It should be noted that these soft soldered joints can be made regardless of the position of the fitting in the pipe line. If the fitting is in a vertical position, the solder flowing between the interior surface of the socket and the outside of the tube will be drawn into the fitting by capillary action just as well as in horizontal positions.

Following these directions, soft soldered joints that are strong and dependable can easily be made, for the solder will alloy with the two metals from which the tube and fitting are made. Therefore, it is more than an ordinary adhesive agent.

Fig. 6. Solder is applied at the edge of the fitting. As it melts, it flows into the space between the tube and fitting. Solder is fed into the joint until a solder ring appears completely around the end of the fitting where the tube enters.

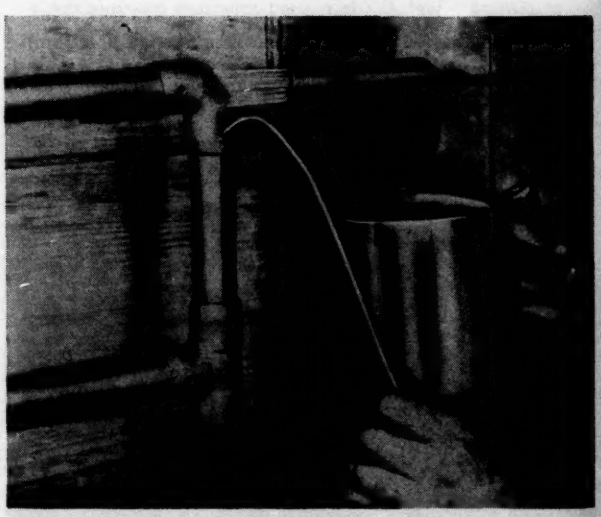


Fig. 7. When using grooved fittings with feed holes, feed solder into hole until it appears at fitting edge. Procedure is the same as in other fittings. Keep hole full.

# What Would You Do?

## Replies to engineering and operating problems of interest to the industrial plant engineer

Conducted by
NATHAN N. WOLPERT
Associate Editor

EVERY large manufacturing plant has its garage where large automotive trucks are housed and perhaps serviced. The tuning up of engines produces a serious ventilating hazard, particularly during the winter months, and that is why the current problem should prove of value to many engineers.

In the boxes on this page are the problems currently treated, and the ones that are scheduled for coming issues. Should you have comments that you would like to add to the questions scheduled for future issues, or if you have a problem of interest to the industrial plant engineer that you would like to see discussed in this department, you are invited to write to the Editor. Helpful suggestions have resulted from such open discussion.

### This Month's Problem

**A small building, separate from the plant, houses five large delivery trucks. Engines of these trucks are tuned by mechanics while the cars are in this garage. An unsatisfactory air condition results, particularly in winter when the large doors are kept closed. What would you suggest as a suitable ventilating system to carry off engine fumes?**

### Answers to this Month's Problem

The preferred method of controlling the amount of engine exhaust gases in a repair garage is to connect the exhaust pipe or tail pipe of stationary vehicles to a duct leading directly to the outdoor atmosphere, with suction provided by an exhaust fan. The alternate method is to exchange the air in the garage by mechanical ventilation at a rate sufficient to dilute the carbon monoxide and irritants in the exhaust gases to safe and acceptable concentrations.

The first method is termed local exhaust, and the second, general ventilation. In the case of local exhaust, it is usually necessary to create the required movement of air by a centrifugal fan operating somewhere between 4 and 8 inches of suction, measured in inches of water. The flexible ducts generally used for this application must be kept at a reasonable size (2½ to 4½ inches diameter) for convenience in handling. Pressure loss through the required length of flexible branch ducts connected to a main duct or manifold is apt to be quite high, from 3 to 6 inches water gage.

In some garages where all the vehicles can be located during service operations, with tail pipes close to outside walls, it is possible to provide direct connection with flexible ducts to the outside air without the use of power suction. The location of the discharge point outside the building must be chosen carefully to prevent a hazard to passers-by or to prevent air pollution nuisance. In this case the connection or adapter between the vehicle tail pipe and the flexble duct must be tight to avoid leakage of exhaust gases into the garage. This method of removing exhaust gases from garages would not comply with health and safety regulations in many communities.

**TABLE 1—AIRFLOW FOR VARIOUS VEHICLES**

| Type and Size of Vehicle | Airflow in Cubic Feet per Minute | |
|---|---|---|
| | Local Exhaust | General Ventilation |
| Passenger cars and light trucks (maximum ½-ton capacity) | 100 | 5,000 |
| Medium duty trucks (maximum 1½-ton capacity) | 200 | 10,000 |
| Heavy trucks or buses | 300 | 15,000 |

The general ventilation method attempts to create sufficient dilution of exhaust gases so that excessive concentrations of carbon monoxide or irritant gases do not occur anywhere in the workplace. This calls for the most intelligent distribution of air inlets and outlets. During the heating season, provision must be made for tempering the large quantity of make-up air required to replace the contaminated exhaust air.

An important difference between the local exhaust and

### Problems for Coming Issues

**January Issue**

**In connection with a storage room where we keep material until shipped, there is a question of how often the cooling coils should be defrosted. Is there any visible indication or simple mathematical approach that would indicate when it is time to defrost the cooling coils?**

**February Issue**

**There are several methods used for welding stainless steel pipe for both shop and field work where the weld is to be made manually. Which do you consider the best method for such use? With the method recommended, are there any precautions to follow to insure a good weld?**

general ventilation methods is the quantity of airflow required. Table I emphasizes the point.

The total airflow requirement is determined from the above figures and the maximum number of engines in operation at any time in the garage, in the case of general ventilation; or the number of flexible branch ducts installed for repair operations at fixed stations, for the local exhaust method. In the latter case, the tail pipe adapter or hood must fit loosely to permit an inflow of air from the room.

It is important to remember that the use of local exhaust ducts at repair stations does not eliminate the need for some general ventilation. Leakage from local exhaust systems, ineffective design of hoods or connection pieces between the vehicle tail pipe and the flexible ventilation duct, and occasional movement of vehicles in the garage under power, all create a need for a moderate amount of general ventilation. The amount of local exhaust of all types in large repair garages becomes sufficient to provide a substantial portion of the general ventilation required for vehicles in motion. In small garages, the amount of time devoted to movement of vehicles under power may be small enough so that natural ventilation through cracks at windows and doors by wind pressure will be adequate for the small and temporary general ventilation requirement. However, natural ventilation is never sufficient to permit continuous operation of an engine in a small garage with doors and windows closed.

*W. N. Witheridge,*
*Ventilation Consultant,*
*Research Laboratories Division,*
*General Motors Corp.*

*Detroit, Mich.*

The problem of carbon monoxide in garages and methods of its control has been periodically discussed in the industrial hygiene and medical literature for many years. The need for the control of this most dangerous gas has been a well established fact from the earlier investigations of the U. S. Bureau of Mines in 1919, on the vitiation of garage air by automobile exhaust gases (Technical Paper 216), to present day investigations by the industrial hygiene profession. The interest and accomplishments of major industries, particularly the steel industry, in the control of carbon monoxide should be applied by all plants regardless of size of plant or type of industry. In this regard, it is important to note that most states have requirements of specific maximum allowable concentrations of carbon monoxide in air, as well as regulations for ventilation design in a few states. The maximum allowable concentration for carbon monoxide in air is generally accepted as 100 parts per million parts of air (.01%) as recommended by the American Conference of Governmental Industrial Hygienists.

**TABLE 2—REQUIRED AIR FLOW IN TAIL PIPES**

| Vehicle | Cfm per Tail Pipe Hood | Diam. of Duct, Inches |
|---|---|---|
| Trucks | 200—300 | 3.0—3.5 |
| Diesel trucks | 300 | 3.5 |
| Automobiles | 100 | 2.5 |

**TABLE 3—APPROXIMATE RESISTANCE TO AIR FLOW FOR TWO SYSTEMS**

| Duct Diameter, Inches | Friction in Inches of Water per 100 ft of Duct | | | | | |
|---|---|---|---|---|---|---|
| | 100 CFM | | 200 CFM | | 300 CFM | |
| | Flexible | Sheet Metal | Flexible | Sheet Metal | Flexible | Sheet Metal |
| 2 | 53 | 19.3 | 193 | 77.0 | 414 | 174.0 |
| 2.5 | 18 | 7.5 | 65 | 24.5 | 130 | 54.9 |
| 3.0 | 7 | 2.6 | 26 | 10.0 | 56 | 23.3 |
| 3.5 | 2 | 1.3 | 12 | 5.0 | 26 | 10.1 |
| 4 | 1 | 0.7 | 6 | 2.8 | 13 | 5.1 |

Exhaust gases from motor vehicles in garages arises from cars or trucks in motion and those with motors in operation during motor tuning and repair. Since engines are generally operated under no-load conditions during tuning, their production of exhaust gas is appreciably less than under road load conditions or a dynamometer test load at any specific or equivalent motor speed. However, the operation of any internal combustion engine at any speed or load conditions results in carbon monoxide in the exhaust gases.

Before discussing ventilation as a means of control, every effort should be made to prevent unnecessary operations of cars and trucks in a garage. The entire problem becomes more acute in the winter when sources of natural ventilation, such as open doors and windows have been reduced or eliminated.

Ventilation may be of a general or local exhaust type, but the latter requires the handling of far less air and is more positive. For example, general ventilation involves the use of exhaust or supply fans, handling 10,000 cfm of air per truck, while local exhaust ventilation requires a maximum of 300 cfm per tail pipe duct. Where appreciable idling of cars is done, in getting into and out of the work locations, both general and local exhaust ventilation may be necessary. In the winter the volume of air exhausted is a most important factor because it involves a considerable heat loss. Therefore, the method of choice is generally the use of tail pipe hoods which trap the exhaust gases as they are discharged and carry them through duct work to the outside. Such tail pipe hoods utilize flexible hose to connect the hood, which fits over the tail pipe, to the duct. The required air flow is listed in Table 2 (1) (2).

The tail pipe hoods which fit over the tail pipe, should fit loosely since tight connections will interfere with the motor tuning. The main duct should be sized to provide a duct velocity not exceeding 2,000 fpm. The duct design may be further simplified since it is not necessary to size it for constant velocity. A centrifugal fan with pressure characteristics above 3 inches of water pressure is desirable. Low pressure fans, such as propeller type, should not be used. The system discharge point should be on the roof and be equipped with a suitable weather cap. It must be understood that the resistance of flexible hose to air flow is considerable more than for round sheet metal duct. A comparison of approximate resistances of the two types is shown in Table 3.

Either an overhead or under floor main duct may be used. Several manufactured units are available for garages, and are suitable if they meet the consideration herein

discussed. The reader is also referred to Plate VS-9 of the Manual of Industrial Ventilation of the American Conference of Governmental Industrial Hygienists for a concise solution to this problem.

Number in parenthesis refer to the following source material:


(1) Industrial Ventilation — A Manual of Recommended Practice, Committee on Industrial Ventilation, P. O. Box 453, Lansing, Mich.

(2) Carbon Monoxide Poisoning in Garages, Division of Air, Pollution Control, City of Cleveland, January 28, 1948.

(3) G. W. Hama, Division of Industrial Hygiene, Detroit City Health Dept. Losses for Sheet Metal Duct Calculated From Formula

$$\Delta p = \frac{L}{CD} \left( \frac{V}{4005} \right)^2$$



*Kenneth M. Morse,*
*Industrial Hygienist,*
*United States Steel Co.*
*Pittsburgh, Pa.*


We have had some experience in advising ventilation for garages similar to the case you have outlined for the December problem. We have also had occasion to make carbon monoxide tests in the garages to determine the effectiveness of the ventilation installed. From this experience, our recommendations would be as follows:

The problem resolves itself into the controlling of carbon monoxide from two conditions—(1) from periodic tuning of trucks and, (2) from the starting and running of engines associated with the truck leaving and being returned to the garage. The problem should be considered in this manner because of the conservation of heat that can be effected if the tuning is ventilated by local exhaust. The local exhaust will require 200 cfm as compared with 10,000 cfm, general ventilation.

It is recommended that the motor-tuning operations be controlled by a ventilating system with flexible ducts, placed at convenient locations near the tuning operations. For the large trucks which you described, we recommend a 3-inch diameter flexible duct which slips over the exhaust pipe of the truck. The duct must have a minimum airflow of 200 cfm. The flexible duct should connect to an untapered main duct. The main duct connects to a centrifugal exhaust fan which exhaust directly to the outdoors. (The flexible duct will have a resistance of 1.2 to 1.5 times a smooth duct of the same diameter.) When not in use, the flexible duct can be lifted out of the way by means of cables and pulleys. The cables can be provided with counter-balanced weights for easy manipulation.

The control of exhaust gases from trucks starting, leaving, and being returned must be done with general ventilation. An air volume of 10,000 cfm per truck engine in operation has been found effective in diluting the carbon monoxide to a safe concentration if the distribution is good. The fan should be located so that the trucks are between the fan inlet opening and the exit doors.

It is not necessary to exhaust the air near the floor, as it has been found that a fan in the roof is more effective than an exhaust opening on the floor. It has been found that it is seldom that all vehicles in a storage garage are started simultaneously.

Overhead exhaust system with flexible ducts installed in a garage.

To get the exact air requirements, it may be necessary to count the number of vehicles running at one time during normal garage usage. In most cases, not more than 20% are running at one time. When all trucks have left the building, the fan can be turned off to conserve heat.


*George H. Hama*
*Industrial Hygienist,*
*Bureau of Industrial Hygiene*
*Detroit, Mich.*


### Answer to Previous Problem

*The following comment is in answer to the problem in the October issue concerning a lift type check valve that was installed backwards:*

Concerning the problem regarding check valves in the October issue, I have reviewed the catalogs of several leading valve manufacturers. The catalog of the Crane Company is the only one showing valves that I reviewed on which the inlet or direction of flow is indicated. On every type of check valve shown in this catalog, the word "inlet" is stamped on the upstream end of the valve body or an arrow indicating the direction of flow is cast integrally with it. Therefore, I believe the simplest solution to this problem is to use check valves so marked, if they are considered suitable.


*Stanley H. Smith, Jr.*
*Utilities Design Engineer,*
*Carbide and Carbon Chemicals Co.*
*Charleston, W. Va.*


**Have you had experience in the fields to be covered by the problems scheduled for the coming issues? It is possible that your comments may prove both helpful and interesting.**

# PRODUCT APPLICATIONS

## New, Unusual, or Ingenious Uses of Equipment and Materials

Conducted by WM. B. FOXHALL, Associate Editor

### Glass Fiber Duct Easily Installed

**PROBLEM:** Installation of the Coleman Blend-Air system of warm air heating in either a new or existing building requires a blending chamber to be installed between high velocity distribution ducts and room's air supply grilles. These chambers are narrow box-like tubes about 6 feet long fitting between two wall studs. In an existing house, installation of the chamber would require removal of interior wall finish to allow setting the chamber in between studs.

**SOLUTION:** In order to reduce the expense and labor necessary for installation, the Coleman Company and Gustin-Bacon Manufacturing Company developed a blender of flexible glass fiber material. Two small openings in the wall are required, one at the height at which the outlet grille will be placed and the other at the level of the inlet grille. The blender, with one header attached, is fed through the top opening until the free end reaches the lower opening. The second header is then attached to the free end of the fiber tube which, being flexible, is drawn down until it fits into the lower opening and is fastened to a transition piece. Both grilles are then placed over the openings. The fiber blender has all the advantages of one made of steel plus unique advantages of its own, according to the manufacturers.

**RESULTS:** Because the glass fiber material is flexible enough to be slipped through a small opening into the stud space, heating modernization is simplified and costs and alteration mess are reduced. Dimensional stability and vibration free characteristics of Ultralite chamber enable quick installation and quiet operation.

### Automatic Boilers Cut Steam Costs

**PROBLEM:** Two years ago the Blue Bird Silk Mfg. Co. of York, Pa. decided to replace coal fired boilers with new steam generating equipment.

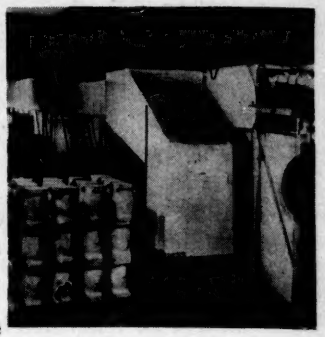
**SOLUTION:** Plant manager Alfred J. Sidler and engineer William H. Wagner selected two 200-hp Orr & Sembower Powermaster packaged automatic boilers. These boilers, burning No. 6 Bunker C oil produce a total of 13,800 lb of steam per hour.

**RESULTS:** Over the past two years, cost of producing steam for processing and heating dropped 20%. In addition, dryer steam is available and new boilers respond more rapidly to variations in load. Maintenance has been negligible over this period.

### Heater Cuts Rubber Curing Time

**PROBLEM:** Bayshore Industries, Inc., Elkton, Md., manufactures false faces and other rubber novelties which are produced by dipping double face molds into a latex solution and then curing the coating. Trials of many curing methods showed most methods to be inadequate for handling the output of dipping tanks.

**SOLUTION:** The plant engineer decided to try supplying the ovens with large volumes of high temperature air. The coated molds pass through the lower part of the oven for initial moisture removal at 160F. Then the masks are stripped and sent into the top part of the oven for final curing at 300F. Heated air is supplied by Dravo Corporation Counterflo heaters of 1 million Btu capacity.

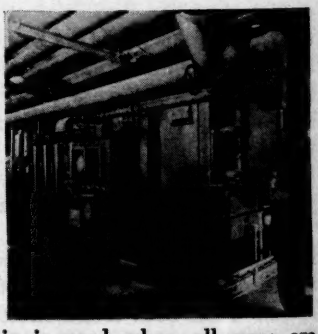


**RESULTS:** Curing time was cut in half and production of rubber novelties increased to such an extent that selling prices of some products could be reduced by two-thirds.

### Air Drys Chewing Gum Coating

**PROBLEM:** At the Ashland Avenue, Chicago, plant of Wm. Wrigley Jr. Company, the candy coating applied to Wrigley P.K.'s must be dried at a carefully controlled rate. If drying action takes place too quickly, coating becomes brittle and chips easily in subsequent polishing operation. If drying is too slow, the tablets become sticky.

**SOLUTION:** Air is supplied to a battery of sugar coating pans at 29% R.H. and 90F by Kathabar Chemical dehumidifiers, manufactured by Surface Combustion Corp. Other processes in chewing gum manufacture are also air conditioned. For application of the sugar coating, the tablets are dried in rotary pans supplied with warm, dry air. Twelve pans are operated with each of eight drying units. A total of 20,000 cfm of dry air is used when all pans are operating.

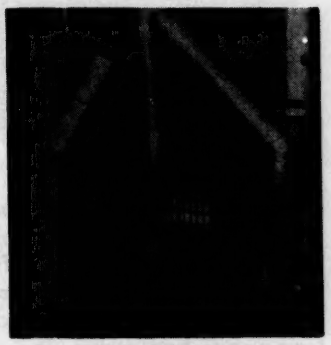


**RESULTS:** Drying time is reduced and rejects by chipping or sticking are eliminated by controlled humidity and temperature. Dust free air is supplied by filtration of the supply air.

## Gas Fired Heaters Speed Wire Production

**PROBLEM:** The Holyoke Wire and Cable Corporation faced a difficult production problem during the early months of 1950. Radio hook-up wire was selling in increasing volume. Plant layout and equipment could keep pace with demand up to the point where a flame resistant lacquer was applied over the insulation. The lacquer room drying facilities could not keep up with other departments.

**SOLUTION:** In May, 1950, a gas fired unit heater supplied by The National Radiator Co. was installed in the lacquer drying tower. Two additional gas fired units were installed later as towers were added to the production line. These heaters replaced electric ribbon resistors previously used.



**RESULTS:** By increasing the air temperature in the drying towers, the gas heaters allowed the wire to be run through the towers at increased rate. Exhaust fans in the towers provided sufficient draft to allow removal of individual fans provided with the heaters. Towers now handle 1500 feet of wire per minute over a 24 hour production day 5 days a week, keeping up with a 6-day schedule in the braiding room.

## Water Heaters Cut Fuel Cost

**PROBLEM:** Cost of providing domestic hot water for 252 families in the Riverside Apartments, Columbus, Ohio, was considered excessive by operators of the project. They were concerned about year round use of a 100-hp boiler with spreader stoker and four licensed firemen to supply domestic hot water in months when building heating was not required. The salaries of the fireman approximated $50 a day. A study showed a three-hour peak demand of 1,350 gallons per hour with incoming water temperature averaging 55F.

**SOLUTION:** Three No. 500 multi-coil heaters, product of Ruud Mfg. Co. were installed. These automatic gas fired water heaters were separately piped for individual operation. Control is maintained by an aquastat in an 850-gallon storage tank set for 135F.

**RESULTS:** From May to August, the bill for natural gas consumed by the water heaters averaged $164 per month. Divided among 252 families, the monthly fuel cost for domestic hot water was only 65 cents per family. In addition to minimum fuel expenses, labor charges for fireman also were eliminated. The wear and tear of operating a large boiler and heavy duty stoker is reduced.

## Owner Adds Cooling to House Plans

**PROBLEM:** When an eight room house, classified as in the high cost field, was about 75% built in Alexandria, La., the owners decided to include air conditioning. The house had no duct work since wall type gas fired heaters were planned for the few occasions when heat is required in Louisiana. The house was a sprawling L-shape, the roof low pitched. Rooms were large, many having one or more walls of glass from floor to ceiling. There was no attic and no basement to serve as housing for air conditioning equipment, and no three phase current, which would be required for a central system, was available.

**SOLUTION:** Zonal air conditioning utilizing seven small compact York residential 1 hp units was designed by engineers of the Baton Rouge York Company. Bedrooms, kitchen and dining room have one unit each, while two units serve the large glass-enclosed drawing room. To minimize use of water, a 7½ ton forced draft cooling tower was located in the carport and concealed behind slatted shutters. Six thermostats were installed for individual room control. Supply ducts are mostly Celotex collars running directly from the unit to the supply grille. Return air duct is the space between three wall studs with the grille located at floor level. Filters were placed just inside the return air grilles and arrangements made for easy removal for cleaning or replacement.

**RESULTS:** The owners are pleased with the high flexibility of the system and the re-sale value of the house is greatly increased. Installation was simple and rapid in spite of difficulties in keeping space clear.

## Electric Cable Melts Snow

**PROBLEM:** Designers of the recently completed John T. Ryan Memorial Laboratory of Mine Safety Appliances Co. of Pittsburgh decided to install a sidewalk snow melting system.

**SOLUTION:** Thermwire electric heating cable, introduced about a year ago by Edwin L. Wiegand Co., manufacturers of Chromalox electric heating units, was installed in the concrete walks along two sides of the building. Seventy-two standard sets of 800 watts each were embedded in 1440 square feet of concrete. The standard 160 foot cable lengths were first fastened to 5 x 20 foot sections of 6 x 6 commercial mesh. After an initial pouring of concrete, the mesh was laid in place and covered with another inch of high density concrete. Leads were strung through piping and connected to junction boxes under the lawn.

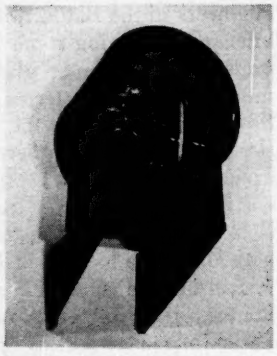
**RESULTS:** Installed capacity will provide a heat intensity of 40 watts per square foot, sufficient to melt the heaviest expected snowfalls as fast as the snow comes down. Operating cost, based on the average Pittsburgh winter, is estimated at about $50 a year.

# NEWS OF EQUIPMENT AND MATERIALS

**Use the prepaid postcard opposite page 129 for securing additional information on items described in this department.**

## Unit Heater Made in Larger Size

A new electric heater, in a 20 kw model suitable for floor, wall, or ceiling mounting, has been added by Edwin L. Wiegand Co., Pittsburgh, Pa., to its Chromalox UB Series of blower-type electric unit heaters. Overall dimensions of the unit are approximately 17 x 21 x 21 inches. Its net weight is 79 pounds. Most of the UB series operate on either 230 or 460 volts single or three phase.



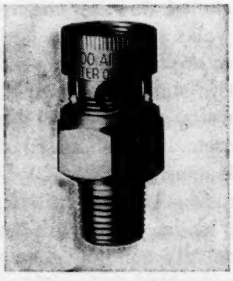
The new heater consists of a heavy-gage, sheet metal case with one or more Koil-fin strip elements sheathed with steel for safety, and a fractional horsepower motor blower. Adjustable aluminum louvers can be tilted to deflect the warm air stream up or down about 20 degrees. A thermal cutout guards against overheating.

The unit heaters can be used as the basic heat source for an office or factory or to supplement the central heating system. In the latter case, they provide heat when it is not practical to use the central system. Easily spotted in any location, they overcome drafts in stairways and other such hard to heat areas. They are also used where precise temperature control is important for production, storage, or curing.

**More information? Circle Item 1 on postcard, page 129**

## Valve for All Radiator Systems

A universal vent valve that will automatically vent air from steam and hot and cold water systems has been produced by Hoffman Specialty Mfg. Corp., Indianapolis, Ind. The new No. 500 air vent may be cleaned without removing the valve or shutting down the system.



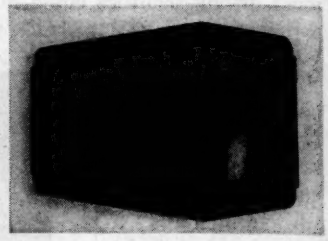
The valve may be used for all radiator systems, operating at a maximum steam pressure of 15 psi and a maximum water pressure of 50 psi. A selector screw controls the rate of venting for the various systems.

A bulletin which describes the operations of the valve for different systems and which gives overall dimensions is available.

**More information? Circle Item 2 on postcard, page 129**

## Versatile Conditioner Is Added

A new Janitrol gas-fired horizontal conditioner featuring versatility has been produced by Surface Combustion Corp., Toledo, Ohio. The unit can be used in top suspension or floor placement in attic, closet, basement, utility room, garage, or crawl space.



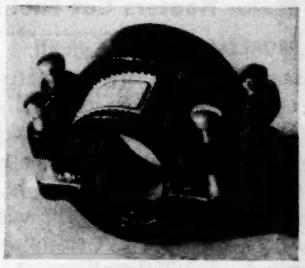
Flexibility and accessibility are accompished by panels on both sides which permit adjustment and removal of controls, blower, and burner assemblies. Retained from the original vertical conditioner line is the construction of ribbon burner alignment to heating tubes which eliminates the need for separate heat exchanger.

**More information? Circle Item 3 on postcard, page 129**

## Connector Seals Leaks, Pipes

Two models of a new connector, designed to either seal leaks or to join units of piping and known as the Bel Connector, are produced by Holoal Mfg. Corp., Bellerose, N. Y.

The elbow type (illustrated) embraces a section of straight pipe and a section of an elbow or T. The pipe type embraces a straight section of pipe. No pressure is exerted on the leak, and installation is accomplished by the tightening of four screws.



The principle involved in the new device is the creation of a cavity around a leak. The fluid, by virtue of the leak, fills the new chamber to the same pressure as exists in the pipe line. The equalization of pressures stops force against the pipe walls and prevents extension of the leak.

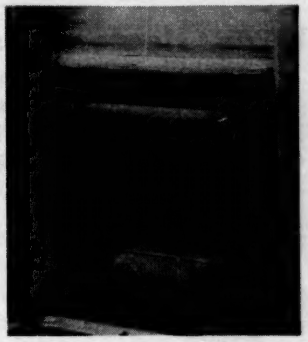
Since all contacts of the device with the pipes and fittings are made with Neoprene, the resultant joint can withstand abnormal vibration without leaks or damage. The Neoprene permits the connector to be used on hot water, cold water, steam, fuel oil, and gasoline on pipes with pressures up to at least 60 psi.

The connector can also be used to connect a piece of pipe to a pipe, or a pipe to a fitting without the need of threading the pipe units. Emergency or temporary lines can be easily and quickly fabricated. When the connectors are used to repair leaky systems, the units can be installed without shutting off the flow. There is no danger of breaking the joint as with present repair units. While the connection is a repair unit it is not necessarily a temporary device.

**More information? Circle Item 4 on postcard, page 129**

## Unit Provides Two-Pass Cooling

A new line of 1953 room air conditioners in which the air is twice cooled is announced by Carrier Corp., Syracuse, N. Y. The units draw air in through the sides of the front grille and pass it twice through the cooling coil and filter before releasing it into the room. This provides two-pass cooling as well as two-pass dehumidification and filtering.



The new line has eight models. Window units are in ⅓, ½, ¾ and 1 hp sizes, with deluxe models in the two larger sizes. Console models will be in 1 and 1½ hp, plus a 1 hp console with water-cooled condensing where an outside air supply is not available.

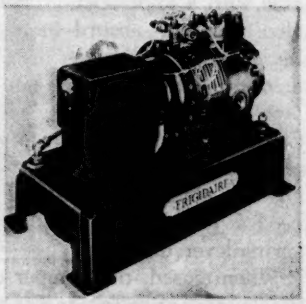
The units can be installed in a window so that its grille extends only as far as the line of the curtains or draperies. This is accomplished by eliminating all air inlet or outlet grilles from the sides, top and bottom of the unit and completely enclosing and insulating the unit in a solid box of girder construction. This also means that it can be set into a wall, at any height, with only the decorative front grille extending into the room, or it can be set in the top of a window or even in a transom.

The ¾ and 1 hp units provide a quick cooler which will make warm rooms rapidly comfortable by building a pool of cool air from the floor upward. Once the air around the occupants has been cooled, the units can be switched to normal operation. All models are equipped for drawing in outside air or room air.

**More information? Circle Item 5 on postcard, page 129**

## 4 Types of Compressors Added

A new line of sealed reciprocating refrigeration compressors, offered in 4 types and ranging from ⅓ through 7½ hp in size, has been produced by Frigidaire Div., General Motors Corp., Dayton, Ohio. Called the XD Meter-Misers, compressors are available in air-cooled, water-cooled, combination air and water-cooled models, and for use with evaporative condensers.




Air-cooled models, ranging from ⅓ to 3 hp in size, feature a new condenser made from a sheet of steel, formed and copper brazed to provide a series of parallel refrigerator passages. Finned tubes are used to increase heat removal and capacity.

The water-cooled models of 1 hp and under also incorporate a new condenser. It is constructed of ½ inch copper tubing, around which circular steel fins are hydraulically pressed, 14 to the inch, and drawn through a similar length of 1⅛ inch steel tubing. The assembly is spiralled around the receiver to make a compact unit. A counter flow method is used for condensation, with water flowing through the smaller tube and the refrigerant through the larger. There are eight water-cooled models in a ⅓ to 7½ hp range. Photo shows ¾ hp unit.

Combination models, available in 6 sizes from ½ to 3 hp, are designed for extreme conditions where surrounding temperatures are 80 to 100 F. These compressors have both a water-cooled and an air-cooled condenser. For all normal operations, the latter is used. When the temperature around the compressor rises above 80 F, the other condenser automatically comes on.

For use in localities where there are water restrictions, evaporative condenser models are offered, ranging in size from 1½ to 7½ hp.

All models feature compact design with a motor compressor unit sealed against dirt and moisture. Direct-drive operation between motor and compressor, which are housed in the same casting, eliminates shaft seals, belts, flywheels, and pulleys. Another feature is the load selector built into the pistons, which can be quickly adjusted to meet each individual load requirement.

The compressors use a plunger-type lubricating pump driven from an eccentric on the end of the drive shaft. There is a permanent supply of oil, and the unit is equipped with low pressure control. Motor windings are cooled by refrigerant gas entering the compressor body. The bodies are mounted on springs for full floating suspension.

Bearings are steel backed babbit, and the receivers are copper-brazed steel with a built-in fusible plug to protect against high temperatures.

**More information? Circle Item 6 on postcard, page 129**

## Adds Larger Gas Burner

A new model 500 Economite gun-type gas conversion burner has been added to its line by Mid-Continental Metal Products Co., Chicago, Ill. This model has a maximum input of 500,000 Btu per hr for all gases. Its minimum capacity is 300,000 Btu per hr.

The burner is designed for converting oil fired installations to gas firing, but it will also allow the conversion of coal fired heating plants with high efficiency.

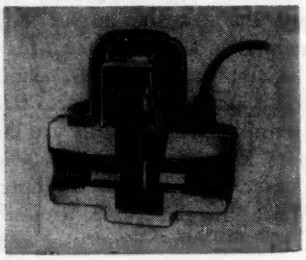
It has a minimum combustion chamber of 10 x 26 inch with 13 inch height or 20 inch diameter. The nozzle lengths are standard 12 inch, short 6 inch, and long 18 inch, all are 5 inches in diameter.

Although it is of inshot design and fires into the refractory chamber, a prefabricated combustion chamber can be supplied if preferred. Other optional features are a mounting flange and instantaneous electronic pilot safety.

**More information? Circle Item 7 on postcard, page 129**

## Valves for All Gas Appliances

Designed to control flow of gas to all gas appliances, the 925-926 Series gas valves has been added to its line of direct-acting gas valves by Penn Controls Co., Inc., Goshen, Ind. The 926 Series differs from the 925 in the addition of a conduit cover incorporating a standard ½ inch female conduit fitting.



The valves, available in ¼, ⅜, ½, and ¾ inch sizes, feature quiet operation and high flow capacity. They can be used with such appliances as central heating, floor furnaces, and clothes driers that have natural, artificial, or LP gas at ½ pound pressure.

**More information? Circle Item 8 on postcard, page 129**

## Plastic Pipe in Two Types

Two types of plastic pipe, flexible and semi-rigid, are being produced by Triangle Conduit & Cable Co., Inc., New Brunswick, N. J. Rigid and high impact plastic pipe will be added to the line. The flexible pipe will be made in three types; non-toxic, industrial and suction. All three are made of polyethylene.

The non-toxic type is available in sizes ½ to 6 inches and all sizes up to 3 inches are available in coiled form. Its advantages are said to be its extreme light weight, flexibility, smooth interior which allows greater flow, and resistance to rot, rust, and electrolytic action. It can be used for the conveyance of liquids and finds application in the food and beverage industries, farming, and jet well installations.

The industrial type has the same characteristics as the non-toxic except that its uses are in the mining industry for removal of corrosive liquids; chemical plants for conveying acids, alkalis, soaps, detergents and bleaching agents; metal plating plants; irrigation on farms and golf courses; the conveying of natural or artificial gas; and sewage.

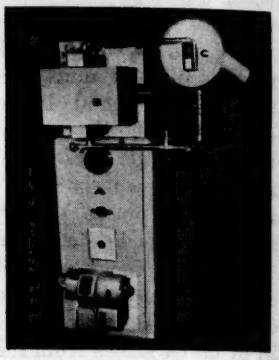
The suction type, available in sizes 2 through 6 inches, is designed for higher pressures in the larger sizes.

The semi-rigid pipe is made of butyrate. It is available in ½ through 6 inches in twenty foot lengths with one coupling cemented. This type is flexible enough to follow ditching contours yet its impact strength eliminates special care in back filling. It is said to find its best applications in the petroleum industry as it is not affected by paraffin crudes, raw gas, sour crudes, or brine. Its chemical resistance and its resistance to rust, rot, and electrolytic action also make it acceptable for irrigation and drainage systems, jet wells, chemical piping; gas service entrance lines; and in the food industry for conveying juices, beer, wine and carbonated beverages.

**More information? Circle Item 9 on postcard, page 129**

## Water Heater Uses Furnace Air

The development of a domestic hot water generating unit which uses the heated air from the home heating furnace to make hot water is announced by Aqua-Air Corp., Elmont, N. Y. The company states that the new unit eliminates need for an independent hot water heating unit.



As shown in the illustration, the unit (B) sits on top of the furnace (A), being installed as low as possible in the plenum chamber. An aluminum shutter is placed on one side of the plenum chamber adjacent to the unit. Supply and return ducts and pipes lead to the hot water tank (C).

A finned copper coil is contained within the steel cabinet with a centrifugal fan that draws the heated air from the plenum chamber over the coils. The water is heated as it circulates through the finned coil.

Overall dimensions of the unit are approximately 19 inches high, 17½ inches wide, and 12 inches deep. It comes in two capacities for one and two family residences, and it is list priced at $164.50.

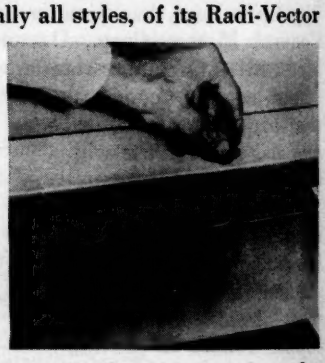
When hot water alone is needed, the damper in the plenum chamber stays closed, preventing the heated air from going upstairs.

The company has available specification, data, and installation information.

**More information? Circle Item 10 on postcard, page 129**

## Knob Works Baseboard Damper

Each type, and practically all styles, of its Radi-Vector baseboard radiation covers are now available with a knob-operated damper, according to an announcement by Vulcan Radiator Co., Hartford, Conn. Flipping the plastic control knob is all the manual effort needed to operate the spring-lever damper.



When closed, the damper cuts off convection heat for the amount of radiation controlled by each damper unit. This permits only radiant heat energy to be thrown off by the units and serves to reduce the temperature in one room without affecting the comfort balance in the rest of the house.

**More information? Circle Item 11 on postcard, page 129**

## Pump for Underwater Operation

An underwater pump, the Diver, which can be lowered into a well on one pipe line and requires no priming, has been produced by Uniflow Mfg. Co., Erie, Pa. The new pump is said to be most efficient when used at water levels of 75 or more feet below surface.

Two models of the pump, DVR-348 at ¾ hp and DVR-1812 at 1⅛ hp, are available. The former, with 120 feet of cable length, is an 8 stage pump, while the latter, with 200 feet of cable, has 12 stages.

Cable is of underwater type and is clamped to the drop line to furnish current to the unit from the controls above ground. The drop line may be of plastic pipe, and it is the service line to the tank which is also located above ground.

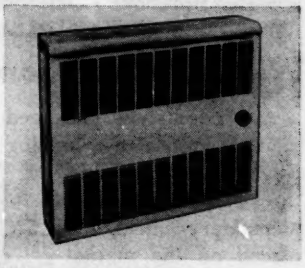
Complete pump assembly includes pump, cable, control panel, pressure switch, bleeder, check valve, air volume control, and pressure gauge. The pump has a capacitor motor directly connected to the multi-stage impeller assembly. Operating at 3400 fpm, it needs no coupling, the impellers being mounted on the extended motor shaft itself.

Some features claimed for the pump are noiseless operation, positive air control, easier installation, and suitability where headroom is limited.

**More information? Circle Item 12 on postcard, page 129**

## Electric Convection Heating

A type of convection electric heating with built-in thermostat in each unit called the Circle-Air convection heating system is announced by Paley Mfg. Co., Brooklyn, N. Y. This new system eliminates furnaces, pipes, chimneys, fuel storage and fuel dirt.



Rated from 2400 to 9600 Btu per hr, 5 sizes are available from 700 to 2800 watts, either with or without built-in Robertshaw thermostat.

Installations can be recessed within or placed against the wall. Temperature in each room is controlled by adjusting automatic thermostat built into each unit, eliminating overheating and underheating. Fin type heating elements are used.

The system is said to be applicable for homes, plants, stores, and supplementary use.

**More information? Circle Item 13 on postcard, page 129**

## Circulator Combats Condensation

Designed to provide a steady, even flow of warm air over window surfaces to combat condensation under winter conditions, the Wesix strip circulator is available in sizes from 50 to 200 watts from Electric Range Co., San Francisco, Calif.

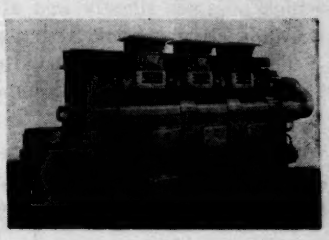
Lengths of the units are 24, 32, 40, 48, 56, and 72 inches. For larger windows, two or more units may be installed end to end. Duplex brackets are furnished so that units may be fastened on vertical or horizontal surfaces. Dimensions are 1¾ inches high by ¾ inches deep.

Employing a low-temperature concealed coil for its full length, a unit draws no more current than a single electric lamp, yet produces enough heat to keep windows clear and to prevent wet rot and paint peeling in sills and window frames, common troubles in many climates, especially in well insulated homes where normal moisture cannot leak out.

**More information? Circle Item 14 on postcard, page 129**

## Reciprocating Grate Stoker

A new spreader stoker offering continuous ash cleaning in units for boilers from 5,000 to 75,000 pounds of steam per hour rated capacity is announced by Detroit Stoker Co., Detroit, Mich.



This feature is obtained by means of a reciprocating grate, alternate sections of which are fixed. This continuously moves the fuel bed forward until it is discharged as ash at the front. At the same time the fuel bed is agitated, keeping it porous and avoiding blow holes or dead spots. Furnace turbulence is provided by over-fire air and cinder return system.

Smokeless operation on light loads, low combustible loss in ash, and quick response to fluctuating loads are other features of the stoker. It will burn any bituminous coal or lignite.

**More information? Circle Item 15 on postcard, page 129**

## Grilles Protect Wall Fin Heaters

Grilles of lightweight, durable expanded metal have been added to its wall-fin heaters, to provide protection and an attractive enclosure, by The Trane Company, LaCrosse, Wis.

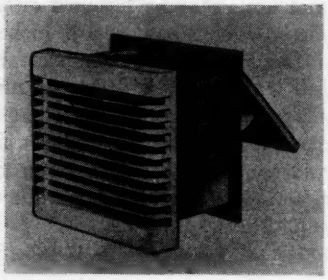
Supplied by Wheeling Corrugating Co., Wheeling, W. Va., expanded metal is made by slitting and stretching solid steel sheet into a smooth, one-piece, diamond-pattern surface that is fabricated to fit over the heater elements. The grilles are available for both single and multiple-element installations.

Wall-fin heaters are made from either steel pipe with steel fins, or from copper tube with aluminum fins, and they may be mounted as single units, or as two- or three-tiered units, on walls and ceilings. Available in lengths from two to ten feet, they can be installed in continuous runs regardless of length of space to be heated.

**More information? Circle Item 16 on postcard, page 129**

## Kitchen Ventilating Fan

A kitchen ventilating fan to remove steam, smoke and odors has been added to its line by American Radiator & Standard Sanitary Corp., Pittsburgh, Pa. Called the Aeropel, this ventilator is recommended for installation near the cooking range.



The unit is manually controlled by a switch chain. A slight pull opens the weather door and automatically starts the fan in operation. Another pull on the pendant closes the weather door and stops the fan.

The fan is driven by a completely enclosed motor which operates silently and at a constant rate of speed on alternating current. It has a rating of 400 cfm.

The wall box is constructed of long-wearing fabricated steel. It is rust-proof and impervious to weather conditions.

More information? Circle Item 17 on postcard, page 129

## Tools Are Powder Powered

Powder powered tools of two types, Drive-It Models 300 and 400, for fastening wood, metal or composition materials to concrete and steel, are placed on the market by Powder Power Tool Corp., Portland, Oregon.

The tools are designed to provide fast and safe anchorages by using a small explosive charge to drive a hardened steel pin into steel and concrete. Preset anchorages, drilling, and power lines are eliminated.

For lighter fastenings, the 300 kit is suitable. It uses 22 caliber power loads and drives pins ¼ inch diameter. Model 400 kit is for heavy duty fastening jobs. It is generally used where unusually heavy weights or vibration is involved and drives ⅜ inch diameter pins.

Both kits contain protective goggles, maintenance tools, power plugs, and operating manual. Different types of pins and accessories may be obtained for varied uses.

Material listing applications, specifications for accessories, and features and containing illustrations and diagram is available from the manufacturer.

More information? Circle Item 18 on postcard, page 129

## Direct Fired Oil Heaters

Listing of its Champion direct fired heaters, light and heavy oil series, has been granted by Underwriters' Laboratories, Inc., to National Heater Co., St. Paul, Minn. Units meet requirements for safety both from the standpoint of electrical control sequence and the safe firebox surface and casing temperatures to qualify on minimum clearance specifications.

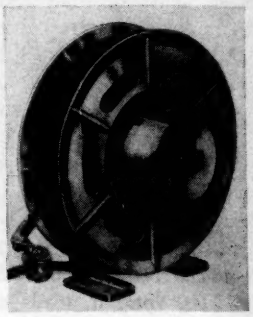
The heavy duty heaters have capacities from 200,000 to 2,000,000 Btu per hour. Units are of welded one-piece construction with a stainless steel firebox of teardrop design.

Suitable for Nos. 1, 2, 4 and 5 fuels, the units are used for the heating of auditoriums, factories, warehouses and other large enclosed spaces.

More information? Circle Item 19 on postcard, page 129

## Retractable Cable Reel

Spring-O-Matic Powereel, an improved spring retractable reel for electric cable, has been placed on the market by Industrial Electrical Works, Omah, Neb. The product is designed for adaptability to all applications and is made lightweight yet durable through the use of cast aluminum wherever possible. They can be supplied for handling up to 150 feet of multiple conductor rubber cables in sizes up to No. 4 and for use with sound or communication cables.



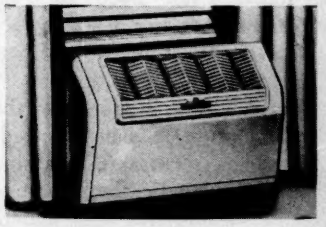
A feature of the device is a rachet which functions in any of four positions. This means the reel may be mounted on the floor, ceiling or right or left wall. This rachet is optional and can be locked in or out of functioning position.

Another factor which increases the adaptability of the unit to different job situations is an adjustable cable guide. The guide can be moved to any desired position on the circumference of the reel, permitting pull-down, pull-up or pull-out unwinding.

More information? Circle Item 20 on postcard, page 129

## Window Conditioner Has Heater

A window type packaged room air conditioner, featuring addition of a heating element that is not affected by outside temperatures and provides supplementary heat, is placed on the market by Mitchell Mfg. Co., Chicago, Ill. A single control knob will switch the unit to any one of seven conditioning levels to meet weather variations.



Three ¾ hp models, M-343 at 115 volts, M-2303 at 230 volts, and M-2083 at 208 volts, are available along with two 1 hp models, M-1003 at 230 volts and M-12083 at 208 volts.

All units have a four direction air louver system, allowing cool or warm air to be directed up or down, to either side, all in one direction, or in four separate directions at once.

Dehumidification, a sound muffler, ventilation control, and odor and stale air removal are other features.

More information? Circle Item 21 on postcard, page 129

## Heater Protects Snow Senser

Development of a new weather sensing unit known as the Snow Detector, designed primarily for the de-icing of microwave antennas but having other applications, is announced by Motorola, Inc., Chicago, Ill. The unit is said to be especially useful for the automatic operation of sidewalk snow removal systems.

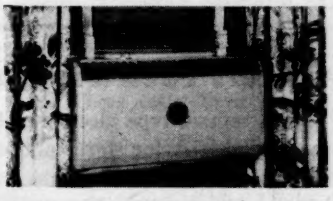
Having a 7¼ inch diameter, the unit detects precipitation when the ambient temperature drops below 37F, the normal borderline temperature for snow. Wherever severe icing conditions and snowfall impair the operation of moving parts, an integral heater melts the snow and ice collected in the bowl. No power is consumed either by the detector or by heaters at higher temperatures. Vertical rods around the edge of the unit prevent birds from nesting in the detector.

Fully automatic, the detector will turn on heating elements whenever icing conditions exist. Up to 30 amperes at 117 volts AC can be switched without external relays. The heaters will then remain on until the icing hazard is past, being automatically turned off by the detector.

More information? Circle Item 22 on postcard, page 129

## Window Room Air Conditioner

A ¾-ton window room air conditioner unit, the FloatingAir, is introduced by Friedrich Refrigerators, Inc., San Antonio, Texas.

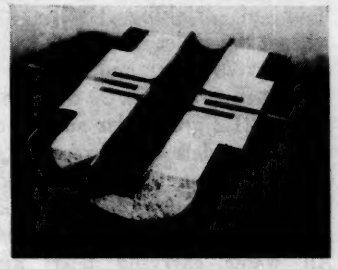


Featured in the new unit is the fully adjustable air flow control with 24 vertical louvers and 3 horizontal louvers, making possible varied air distribution and directions. The unit will retail at $299.50.

More information? Circle Item 23 on postcard, page 129

## Anchor for Insulated Piping

A new type of insulated anchor for use in underground insulated pipe systems conveying hot or cold liquids or gases has been developed by Durant Insulated Pipe Co., Palo Alto, Calif. The anchor is so constructed that contact is eliminated between anchor plate and pipe.



The plate is insulated from the pipeline both thermally and electrically by a non-compressible block of Transite sheet material. Design and material serve to minimize heat loss at anchorage points and prevent pipeline corrosion due to electrolytic action. The entire line can now be insulated from ground by taking supplementary precautions to insulate the line at the terminals.

More information? Circle Item 24 on postcard, page 129

## Salamanders Are Butane Fired

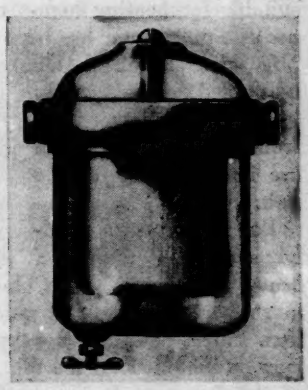
The marketing of a new butane fired salamander, the Port-A-Heat, has been announced by Port-A-Products Co., Dayton, Ohio. The unit is smokeless, greaseless, sootless and non-toxic, which permits operation without use of a vent pipe.

The units weigh only 14 pounds, and are 21 inches high and 13 inches wide. Outputs run up to 36,000 Btu per hr. They are furnished with 5 foot armored hose for tank connection. Twenty foot hose length is available. LP gas tanks are not furnished with units. These units do not get red hot and may be moved without waiting for metal hood or sides to cool. They can be used for warehouses, foundries, shops, building construction, manufacturing plants and garages.

More information? Circle Item 25 on postcard, page 129

## Oil Filter for Larger Burners

Incorporating a pre-screening top section, a large Microstone ceramic filter element, and designed to operate with the largest oil burner installations, the new Sette Model KS fuel oil filter has been announced by Marquart Mfg. Co., Oakland, Calif. It was claimed that the filter has scarcely more resistance to fluid flow than that imposed by the ⅜ inch inlet and outlet tube fittings.



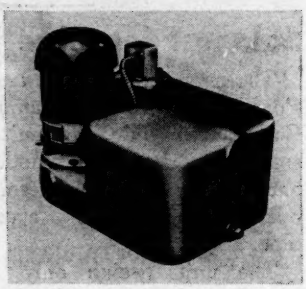
The top 120 mesh prescreening section can be cleaned independently, and is said to take 80% of the work off the filter element. A drain cock provides for removal of sediment or water in the main filter bowl. Unbreakable, transparent prescreening dome cover and filter bowl allow user to see when section needs cleaning. The filter element may be removed for cleaning or replacement by release of a single screw. All service operations may be performed without disturbing line connections.

Ceramic element design permits the removal of harmful scale, dirt, and water, while maintaining free flow through controlled high porosity. The unit is recommended for use on the suction side of pressure fuel feed systems.

More information? Circle Item 26 on postcard, page 129

## Condensate Return Units

A new line of simplex and duplex condensate return units, tradenamed Apco-Matic, both in a capacity range for handling condensate for heating systems rated from 800 to 10,000 EDR and pressures up to 50 psi, has been produced by Aurora Pump Co., Aurora, Ill.



Combining the features of vertical turbine-type pump design with minimum space requirements and automatic operation, the pump has no shaft bearings to wear and become noisy. Pump and motor are mounted on resilient synthetic rubber.

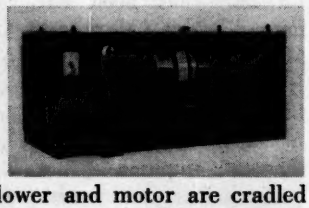
Pumping unit is of bronze to avoid corrosion and compactness with high capacity is achieved by means of a rectangular receiver. A low return opening is for connection to return lines close to floor, yet providing ample suction head for efficient operation.

Dual discharge openings provide optional connection for piping to boiler and a mechanical seal eliminates leakage. Replacement of worn parts or complete unit can be made without disturbing piping connections.

**More information? Circle Item 27 on postcard, page 129**

## Oil-Fired Furnace is Suspended

A horizontal pressure atomizer oil-fired furnace having a bonnet output of 80,000 to 180,000 Btu per hr and suitable for heating homes or for commercial-industrial use as a unit heater has been announced by Iron Fireman Mfg. Co., Cleveland, Ohio. It is delivered completely assembled, and is easily installed by suspension from the eyebolts, which are integral parts of the unit.



Burner parts are rigidly supported within a heavy gage frame. Both blower and motor are cradled in rubber to absorb vibration and assure quiet operation. Filters of spun glass type are provided; filter racks may be mounted on the top, bottom, end, or either side of the furnace. An automatic feed type humidifier is optional equipment. Convenient service doors permit quick access for inspection.

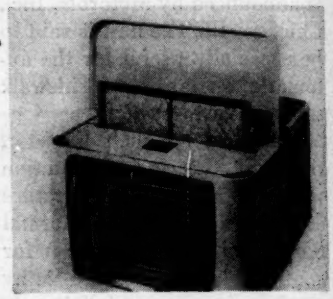
A series of corrugated flue sections, nested side by side, concentrates a great amount of heating surface in the path of the blower. Heavy 12 gage steel is used.

In large single rooms requiring more than 180,000 Btu per hr, multiple units may be installed, controlled generally by an individual thermostat located near each furnace. The suspension feature permits easy installation in attic spaces and crawl spaces of houses without basements and is adapted to the needs of such buildings as service stations, shops, garages, and warehouses, where floor space is at a premium.

**More information? Circle Item 28 on postcard, page 129**

## Window-Type Conditioners Added

Four new models of window-type room air conditioners, Series ACE-33, 50, 75, and 100, have been introduced by Crosley Div., Avco Mfg. Corp., Cincinnati, Ohio. The models, which feature quick installation, are ⅓, ½, ¾, and one ton units, respectively. They are capable of cooling and dehumidifying rooms in areas of, in the same order, 230, 325, 485, and 600 square feet.



The one ton unit, added to the lesser sized models for the first time in this line, is 27 inches wide and deep and is 15½ inches high. It extracts 3.2 pints of moisture from the room's atmosphere per hour.

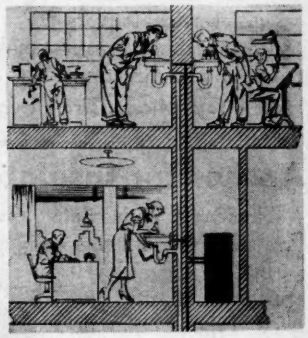
The ¾ ton unit, which has the same dimensions, extracts 2.5 pints of moisture per hour and circulates 700 cfm of air. The ½ ton unit, which is of the same width and depth but stands 13½ inches high, extracts 1.8 pints of moisture per hour and circulates 560 cfm of air. The ⅓ ton unit is 13½ inches high, 22⅜ inches wide, and 26½ inches deep. It extracts 1.3 pints of moisture per hour and circulates 470 cfm of air.

All models use permanently lubricated motors and feature a cabinet design that permits easy filter removal. Louvers adjustable to three directions permit control of the direction of air flow.

**More information? Circle Item 29 on postcard, page 129**

## Coolers Feed Several Fountains

Two remote type electric water coolers, an air cooled model WAP7A for stores and offices and a water cooled model WWP13 for factories, which can serve 50 deg. drinking water through several wall fountains, have been developed by Electric Appliance Div., Westinghouse Electric Corp., Springfield, Mass.



The air cooled model will supply 12.1 gallons per hour of drinking water where the inlet temperature is 70 deg. and the room temperature is 80 deg. The water cooled model will supply 21.2 gph under similar conditions.

Both models have brass water cooling chambers and heavily tinplated interior surfaces. The refrigerant flows through coils of copper pipe. Granular cork sealed in an air and moisture tight enclosure insulates the chamber. All water carrying parts are insulated to prevent sweating.

**More information? Circle Item 30 on postcard, page 129**

(*Continued on page* 120)

# ANOTHER CASE OF Copper WHERE IT COUNTS

Architect: Kinne & Pennock—Utica, N. Y. Assoc. Architect: Robert Trowell—Rome, N. Y. Mechanical Engineer: Malcolm B. Moyer—Syracuse, N. Y. General Contractor: Peter Reiss Construction Co.—Brooklyn, N. Y. Plumbing Contractor: O'Shea Supply Co., Inc.—Rome, N. Y.

When Government regulations curtailed the use of copper water tube a while back, many plumbing and heating contractors, instead of taking a handy substitute, still knocked themselves out trying to stretch what copper they could use to cover the permitted applications where the use of copper was most vital. There must have been a reason for this. There was.

There are some spots in building construction where rustable materials have no place. Water lines is one of them. And in a 180-apartment project such as Liberty Gardens, it's mighty important that piping be non-rusting, long-lasting, easy to install. Revere filled the bill with 16,000 ft. of Revere Copper Water Tube for hot and cold water service and supply piping in sizes ranging from 4" to ½".

Now, with restrictions eased, and quantities permissible without allotments greatly increased, there isn't any reason why your next job can't have the many lasting benefits of Revere Copper Water Tube for hot and cold water lines, radiant panel heating, underground service lines, processing lines, and waste stack and vent lines. See the Revere Distributor nearest you today. And, if you have technical problems, he will put you in touch with Revere's Technical Advisory Service.

**REVERE**

**COPPER AND BRASS INCORPORATED**

*Founded by Paul Revere in 1801*

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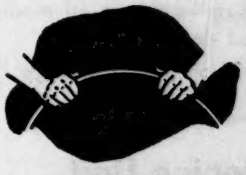
*Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere*

SEE REVERE'S "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY

## WHY REVERE COPPER WATER TUBE IS PREFERRED BY—

*Architects, Builders, Plumbing & Heating Contractors*



### EASY TO BEND

*Saves Time*

Revere Copper Water Tube is easy to bend. Soft temper can be bent by hand to meet installation conditions. Hard temper by hand bending tools.

### HANDY LENGTHS

*Save Fittings... Labor*

Revere Copper Water Tube comes in straight lengths of 20' in hard and soft tempers. 60' coils of soft temper reduce the number of fittings needed.

### SOLDER OR COMPRESSION FITTINGS

*Need Less Work Room ... Save Metal*

No worry about wrench room when you use Revere Copper Water Tube with solder fittings. Compression fittings can also be used. No threading is necessary with either type fitting. Wall thickness of tube used can thus be less than for threaded pipe.

### NON-RUSTING

Rustable pipe eventually clogs as shown in drawing at top right. Non-rustable Revere Copper Water Tube suffers no loss of flow or pressure as shown at bottom right. No allowance in pipe size need be made for rust accumulation with Revere Copper Water Tube.

(*Continued from page* 118)

## Convertible Humidity Control

A plug-in humidity controller which is an automatic humidistat control to operate electrically powered humidifiers and dehumidifiers is announced by Abbeon Supply Co., Jamaica, N. Y.

The humidity scale extends from 10 to 95% relative humidity, and the unit is 7 inches long, 2¾ inches wide, and 2⅞ inches deep, weighing 2 lb. Priced at $35, the controller comes equipped for wall mounting, and it must be specified as to whether they are to be used for humidifiers or dehumidifiers, as there is a change in the wiring.

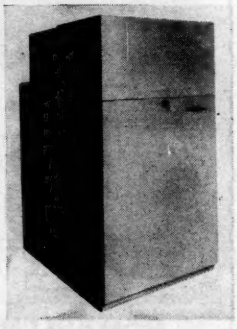
Operating in much the same way as a room thermostat, the control is hung on a wall and the dial is turned to the percentage of relative humidity desired. When used for dehumidifying, the control turns off the dehumidifier if the humidity rises above the setting and shuts it off when the humidity falls below the set percentage. When used with humidifiers, the reverse is true.

To install the control in conjunction with existing humidifiers or dehumidifiers, the unit is plugged into the control, which is then plugged into the nearest 110 volt wall outlet. The control will handle almost all modern types of electric humidifiers and dehumidifiers.

**More information? Circle Item 31 on postcard, page 129**

## Year Round Conditioning Unit

A new model residential air conditioning unit for year-round use, the Typhoon S-W unit, incorporating a design permitting changing back and forth from cooling to heating by flicking a single switch in the living area, has been produced by Typhoon Air Conditioning Co., Inc., Brooklyn, N. Y. The unit does not require dampers.



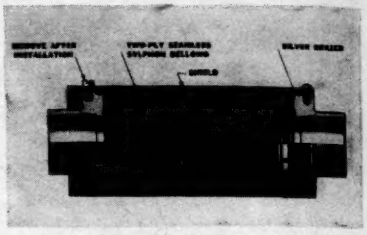
Designed for use in a new home or as a replacement for present warm air furnaces, overall dimensions of the complete unit are 50 x 37 x 70 inches which will allow installation in any convenient space in the house. The cooling section alone can be supplied for connection with existing warm air furnaces.

Models of the unit are in capacities of 3 and 5 tons on the cooling side, with a minimum heating output of 80,000 and 112,000 Btu per hr. These models are designed for heating with natural, manufactured, mixed and LP gases, and production will soon begin on a model that utilizes oil. The company announced a smaller model in production with a capacity of 2 tons, available also for use with oil.

**More information? Circle Item 32 on postcard, page 129**

## Pre-Assembled Expansion Joint

A packless expansion joint for hot water lines, the Sylphon 96066, which provides a compact means for absorbing expansion of baseboard radiation, finned convectors, and horizontal supply lines, is now under production at Fulton Sylphon Div., Robertshaw-Fulton Controls Co., Knoxville, Tenn.



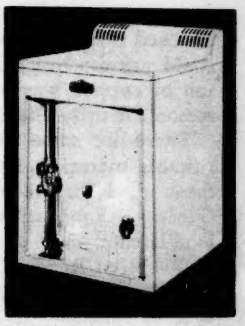
The new joint is presently being made for pipe sizes ¼, 1, 1¼ and 2 inches. It absorbs line expansion up to ½ inch which is sufficient for 30 feet of copper line on 140 degree temperature rise or 40 feet on 110 degree rise. Maximum working pressure 40 psig; maximum test pressure, 60 psig.

It is a complete, factory-assembled unit, and can be easily installed or removed from the line. A two-ply seamless Sylphon bellows absorbs pipe line expansion and provides a positive seal against leakage. The bellows is made of phosphor deoxidized copper for corrosion resistance, and other parts are made of brass.

**More information? Circle Item 33 on postcard, page 129**

## Water Heater Installed 3 Ways

Built for flush to the wall installation and equipped with automatic thermostatic control, the Perfection table top gas water heater has been introduced by Combustion Engineering-Superheater, Inc., Chattanooga, Tenn. Its gas and water lines may be connected in one of three ways; straight out at the back, to the back and down through the floor in cabinet corners, or to the front and down through the floor.



The unit is available in 20 gallon capacities for natural, manufactured and LP gases. For high input operation it is rated at 25,000 Btu per hr with 21 gal per hr recovery for a 100 degree temperature rise, although it can easily be converted to low input operation at 5,000 Btu per hr with 4.2 gal per hr recovery.

A draft hood built into the top of the heater makes the flush wall installation possible, and its cover may be removed for access to baffle and flue.

Other features of the unit include an arc welded tank, zinc bonded connections, copper dip tube to keep incoming cold water from mixing with already heated water, and a spiral baffle for maximum heat transfer. A pressure and temperature relief valve is optional at additional cost.

A folder giving design data and specifications, and describing and illustrating methods of installing the flue vent and connecting gas and water lines is available.

**More information? Circle Item 34 on postcard, page 129**

# Remember how you longed for air conditioning last summer?

You swore you'd never go through another summer without air conditioning. Now—today—is the time to do something about next summer. Here's why:

Your Westinghouse Contractor isn't rushed now. His men can install your new unit faster, better . . . without overtime. He will save you money. And he will do the work when it suits *you*—without disrupting your business.

It will pay to select Westinghouse equipment because:

**Westinghouse costs less to operate.** Its refrigerant-cooled motor saves on electric power and upkeep. Its hermetically-sealed design means less maintenance, fewer service calls.

**Westinghouse gives better performance.** Only Westinghouse designs and builds all components. This means smoother operation and longer life, because all parts have been precision-built to work together.

**Westinghouse has a full equipment line.** Whatever you require, from 2 tons up, a Westinghouse system will match your needs. Only Westinghouse offers so complete an air conditioning line.

Interested? Want to do some advance planning? Then send for the Westinghouse Planning Guides. Or better still, call your local Westinghouse Air Conditioning Contractor for a free estimate. He'll be glad to help you. He's listed in the Yellow Pages of your classified directory.

**YOU CAN BE SURE...IF IT'S**

**Westinghouse**

AIR CONDITIONING

J-80283

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Air Conditioning Division
180 Damon Street
Hyde Park, Boston 36, Mass.

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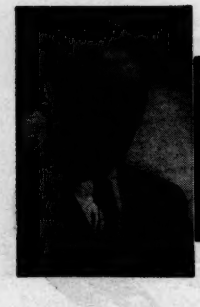
- ☐ Send me the "Planning Guide for Industrial Air Conditioning".
- ☐ I want a free estimate of the cost of air conditioning my premises.

Name.....
Company.....
Address.....
City.....Zone.....State.....



# Experience is my Classroom

By T. W. REYNOLDS

**• LEAKS AND CORROSION**

In the past, the older a pipe became the less it was worth. With to-day's rising costs for both replacement and possible leakage loss of an expensive product, it may even be possible that the pipe is increasing in value the more it ages. It should also be pointed out that the longer the original pipe can be left in place, the less its original cost will be per year of usage.

As a result of corrosion we spend considerable time in locating leaks by various methods of ever-increasing improvement. The General Electric Company now has a photoelectric recorder for use with underground water pipes, one which gets ahead of any leakage by indicating current drop wherever there is corrosion. Shell Development Company, Inc. has a so-called Probolog for boiler tube insertion to detect corrosion. A connected recorder indicates where a tube is corroded. No need then for a time delaying expensive hydrostatic test which may indicate corrosion only by starting a leak that may give trouble.

**• GOING PLACES**

Heating, ventilation and air conditioning systems are far from where they started—and this in our own life time. I wonder if we realize how far we have gone. Thus, to-day's coal mine may use a daily amount of ventilating air that is in weight six times the coal removed from the mine during the same time. A mere residential air conditioning system may have an electronic control panel that monitors over 100 thermostats. Of course, it should be explained that the "mere residence" is the White House.

There is a pool on a ranch in the Nevada desert which faces the sun at 130F, but which nevertheless contains cold water fish such as trout. In the summer, the underground water supply to the pool at 80F is refrigerated 5F by each evaporation from an aerating fountain and further refrigerated by coils if and to the extent required. From fish to violins is a rather abrupt transition, but nevertheless there is a violinist in Puerto Rico who makes good use of a ½ ton air conditioning unit just to preserve his rare violins.

In Indiana one can note how seed corn is kept for long periods by maintaining a humidity of not over 10% and a temperature just safe above the freezing point. In the case of New Orleans it is the weevil that must be fought and kept out of stored beans and peas by providing him with a low humidity and a temperature of about 40F. In still other places one finds small seeds in storage and also cooled, although only to 70F, just enough to prevent germination.

Atomic energy has produced a lot of complications in ventilating systems. There may be accidents and power failure must be considered. Serious study is now being given to adequate air locks between hot and cold pressurized zones to protect workers against contaminated air that may be present in atomic plants and laboratories.

Snow and ice melting applications continue at each writing to increase in number and diversity. One recent application is a school court yard in Newark, N. J. Benefits reported are children at play with dry feet and clothing so that there are fewer colds, less accidents, more use of the yard, and less tracking of snow and dirt into the class rooms.

Heating cable is now widely used and provides a flexible arrangement suited to most anything from soil heating and the melting of ice on steps, roofs, gutters and downspouts to the prevention of freezing of pipes, valves, meters, pumps and manholes.

Making a radiant heating panel out of a conductive rubber mat is quite the thing now for keeping the feet warm in low temperature conditioned or refrigerated places. The mats are wired for electricity.

**• INSULATION MUST BE ALL THINGS**

Advertising literature before me displays glass fiber insulation in continuous blanket form and enumerates all the rigid requirements for present insulation. At one time we thought of insulation only in terms of price and a cover for a hot pipe regardless of its temperature. This was followed by a period when the main concerns were insulation thickness according to temperature and service, thermal efficiencies, acoustical properties, and the greatest possible monetary saving.

Somewhat later we were also specifying that insulation must be resistant to vermin, odor, corrosion, vibrations, and high moisture pick-up from the air. Today it is desirable that insulation have still further qualities—light weight, ease to install regardless of shape covered, and ease to cut. Of course, the material must not sag and should be able to withstand rough handling following installation, yet retain thickness and shape.

**• STAND-BY TEMPERATURES WITH ANTI-FREEZE**

A reader raises an interesting question as to the possibility of using some anti-freeze mixture in the forced hot water baseboard heating system of a residence during an owner's extended absence in the colder months. He also writes that the room thermostat is then lowered to 38F or 40F, but since the caretaker makes inspection only once a week, there is a freezing hazard in case of burner or boiler failure.

(*Continued on page* 124)

# men over 45

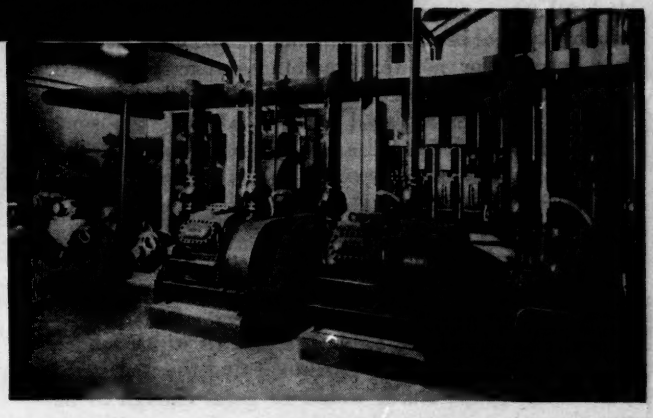
More than six times as many men of your age will die of lung cancer this year as died in 1933, according to official reports. Though our research scientists are making every effort to discover the reason for this increase, they still don't know the answer.

They *do* know, however, that the lives of over half of those who will develop lung cancer *can* be saved...if they get proper treatment while the disease is still in the silent stage, before any symptoms have appeared. That is why we urge you to have a chest X-ray every six months when you have your regular health check-up... no matter how well you may *feel*. Only an X-ray can detect the "silent shadow". It is your best insurance against death from lung cancer.

For more information about this or any form of cancer, call our nearest office or simply address your letter to "Cancer" in care of your local Post Office.

*American Cancer Society*

## In the Morris Harvey College Main Building... It's VILTER Again



During the past decade, Morris Harvey College, on the Kanawa River at South Ruffner, West Virginia, has grown from a small rural college to the third largest of its kind in the State. Recently completed is Morris Harvey's new Main Building—"six buildings in one." This new fireproof building boasts complete air conditioning and sound proofing, as well as every modern teaching facility. Refrigeration, of course, was by Vilter.

Three Vilter six-cylinder VMC Freon compressors provide over 150 tons of refrigeration for the air conditioning system. Two Vilter indoor evaporative condensers mean big water savings. A Vilter copper tube water cooler chills the water circulated through the cooling coils.

Whether it's cooling for comfort, for worker (or student) efficiency, or for process in your plant, Vilter refrigeration can help you. A Vilter installation means more than dependable, economical cooling... it's an installation that is engineered to fit your problems exactly.

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(*Continued from page* 122)

To this I might add the possibility of power failure, or even oil failure should a burner run continously due to an open window, especially so if the window is in the same room as the thermostat. Sometimes a safety control acts to stop a burner, the tank runs dry through negligence, or the tank empties because of rupture or severe leakage. All these things that were mentioned have happened.

The safe and economical temperature at which an occupied space should be held under standby conditions to eliminate the freezing hazard will range from 40F to 50F. The precise setting of the thermostat within this range depends upon the number of degree days of the locality, the particular structure with its degree of insulation, sun and wind exposure, duration of standby, type of heating system and radiation. It depends upon whether or not the plumbing system is drained, and whether the pipes for plumbing and heating are located along outside wind exposed walls, or in some underheated room. Special consideration should be given where there are radiators and pipes of small water content in any location that is exposed or poorly heated. The temperature at which a heating system should be held to preserve the house and furniture is another matter. Usually, such temperatures range from 50F to 60F.

From these comments, Table 1, and costs which follow, there does not seem much likelihood that the fuel saved by lowering temperatures would be great enough to be attractive when compared to the cost of an anti-freeze mixture which would make the lower temperatures possible. However, the use of anti-freeze from an insurance standpoint is entirely another matter and should be fully justified for such protection.

**TABLE 1—ANTI-FREEZE REQUIREMENTS**

| Radiation, Sq Ft | Boiler Type | System Volume, Gallons | Anti-Freeze Volume, Gallons |
|---|---|---|---|
| 600 | Conventional | 60 | 30 |
| | Flash | 41 | 20 |
| 1000 | Conventional | 98 | 49 |
| | Flash | 66 | 33 |

Table 1 gives the average water content as found by experience in residences for forced hot water panel and baseboard systems. The two systems hold approximately the same amount of water as based on 200 Btu per sq ft of radiation. Most of the water is in the boiler if the boiler is of the usual type. It will be seen from this table that a flash or small water content boiler, such as Khem, Triad, certain Janitrols, and ones made by A. O. Smith Corp., makes a substantial reduction in the system volume. The approximate requirement for anti-freeze is based on 50% of the system volume, and this percentage is usually recommended for either ethylene or propane glycol. However, a concentration of 40% ethylene or 45% propane will allow operation down to −15F and may be used.

Socony-Vacuum Oil Company has a product called Permazone, also an ethylene glycol base anti-freeze with an added inhibitor. E. I. du Pont de Nemours & Co., have a solution with an ethylene glycol base (and added inhibitor) called Zerex.

The average residence in the vicinity of New York City with a heating system of 600 sq ft capacity might save up to $50 on fuel during the four colder months of the heating season by lowering the temperature of the thermostat setting 10F below the standby setting made without the use of anti-freeze. Therefore, only with a flash boiler and a reduction of solution to 25% freezing at 10F or a conventional boiler and 17% solution freezing at 20F, would there be any fuel saving, based on a cost of $3.75 per gallon for the anti-freeze solution. On the other hand, for solutions of greater strength, up to 40%, the cost of the solution will not exceed the fuel saving to a prohibitive degree.

The cost of replacing the solution or inhibitor, all or in part, should be kept in mind. Excessive temperatures may break down the mix and any leakage requires replacement. In addition to these possible costs there may be some slight increase in fuel consumption because of the somewhat poorer heat transfer properties of an ethylene glycol solution as compared to water. It may be necessary to heat the glycol solution a few degrees hotter to maintain the same room temperature as with water in the system. The extent of this small increase would depend upon a number of factors including system design and concentration of the solution.

Glycol solutions increase pipe friction and the total circulating head on the pump from 40% to 50% due to their increased viscosity over that of water. If a heat exchanger is used, it may have to have double the heat transfer surface that would be required with water. The manufacturer of the heat exchanger should be consulted and given all the conditions in detail.

Percentage of anti-freeze for any given protection can be obtained from standard protection charts supplied for automotive use. Testing of the solution for freezing protection can be done with the hydrometer field tester used in most service stations. The condition of the solution should be checked at intervals to determine whether the effectiveness of the inhibitor is being impaired with use. This can be done by noting first the appearance of the solution and secondly by filtrating with a standard acid solution to determine any loss in the original reserve alkalinity.

Products with an alcohol base should not be used in heating systems because of possible hazards arising from their inflammability. One fire has already occurred from fumes ignited by an electric spark. To this danger may be added explosion and suffocation hazards from alcohol fumes when temperatures are raised to slightly above those normally used in snow melting systems. Methanol based products present more of a toxic hazard than do ethylene glycol based products. Even ethylene glycol is toxic to human beings if taken internally, hence the care taken to isolate systems containing glycol anti-freezes from domestic water supplies.

The water content of pipes in gallons per linear foot is .016 for ½-inch, 0.022 for ¾-inch, 0.044 for 1-inch, 0.077 for 1¼-inch, 0.105 for 1½-inch, 0.173 for 2-inch, 0.247 for 2½-inch, 0.382 for 3-inch, 0.511 for 3½-inch and 0.658 for 4-inch pipe. The water content of the boiler, the expansion tank, and the heat exchanger, if any, must be added to the calculated water content of the piping.

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*DIALAMATIC CONTROL*

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**Made Stronger**

**SPECIFICATIONS**

The face and blades of model PH-142 are fabricated of 16 gauge steel, the blades are set in a fixed-fan angle degree for even deflection. The frame is of one piece, 18 gauge steel construction. The Louvre box fabricated of 16 gauge steel. Packed one to a box, and 20 to a master carton. Comes handsomely finished in gleaming, durable metallic-lustre, 4 sizes available.

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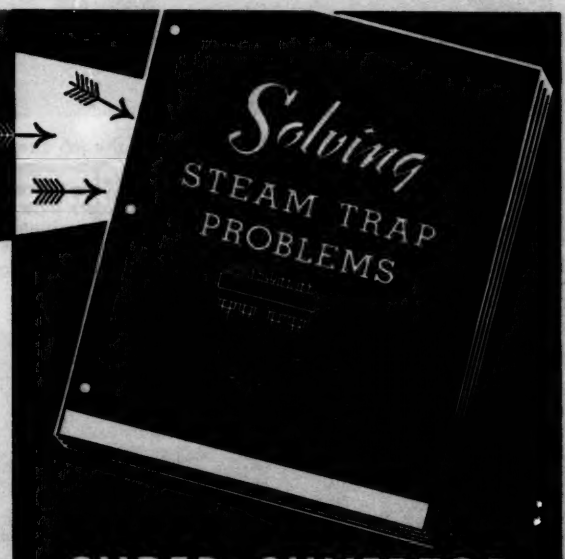


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The 36-page book "Solving Steam Trap Problems" contains information you need to know about steam traps. It's an invaluable reference book for engineers and owners of steam using equipment. It contains simple formulas, direct reading charts and helpful graphs and tables. For example: Suppose you want to know how to simplify piping, how to save steam trap installation time, or how to cut down on the number of necessary fittings. You can find the answers right here in this book. And in addition you'll find condensation rate charges, graphs and tables—and short formulas for computing condensing capacity of steam using equipment. Save time and trouble—don't deny yourself the aid of this handy volume—send the coupon today for your free copy of "Solving Steam Trap Problems."

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# NEWS OF THE MONTH

## RADIANT HEATING

**is used to heat an elementary school. Pictorial sequence shows routine way in which job is performed.**

Radiant heating, one of the controversial subjects in the construction industry during the forties, is becoming as matter-of-fact as indoor plumbing. Pictorial testimony to the routine manner in which radiant heating jobs are now handled is given in the step-by-step photographic record of the steel pipe installation at Washington-Douglass School, Jackson, Tenn. The school, designed by Spencer and Ross, Jackson architects, was built by McCrory Construction Co. Brady-Horne Plumbing and Heating Company installed the building's radiant heating system as well as the plumbing. Electrical work was done by Townsend Electric Co. All pipe in the heating plant was furnished by Spang-Chalfant.

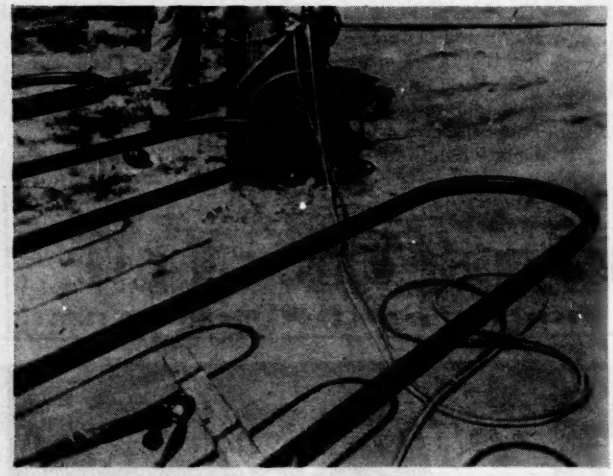


Fig. 1—Radiant heating installations start at the job site. Pipe is fabricated and tested as construction begins. Workmen bend steel pipe into coils of predetermined radius. They were used mostly as continuous type on 12 inch centers. Modern pipe bending technics have aided in solving some of the problems encountered in early radiant heating installations. Close-up of the steel pipe used here shows how little actual distortion occurs when pipe is bent to form coils.

Fig. 2—Pipe waste is negligible with the continuous coil design used in this radiant heating installation. A welder joins two lengths of pipe in completing a single panel. On this job, more than 30,000 feet of pipe, the bulk of it being standard ¾ inch steel pipe in uniform 21 foot lengths, was used.

Fig. 3—All lengths of pipe are pressure tested at the job site before being installed. Heating installation starts with a gravel sub-base. After the footers have been put in, a 5 inch sub-base of fine gravel is laid to provide adequate drainage away from the concrete slab which will be laid above the sub-base. Tests conducted at job site insure that installation meets design and engineering specifications.

Fig. 4—Heavy asphalt paper covers the gravel sub-base. This paper provides additional protection against vapor and moisture and is tied down with overall covering of meshed wire. The finished school has room for 460 children, contains 16 classrooms, an elevated auditorium, a gymnasium, a library, an audio-vision room, and janitor's quarters. Hoffman Panel-Matic controls with outdoor temperature detector bulbs were used, weather changes automatically controlling indoor temperature.

(*Continued on page* 128)

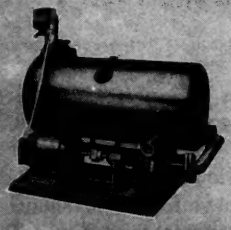
Any engineer will tell you **Skidmore** offers more pump performance

There's a wide range of types and capacities for every heating pump need. Let Skidmore advise you on your next tough job.

**TYPE UV**

*Type UV Condensation Pump is designed for below floor level returns, and is built in single and duplex units.*

Write for *Bulletin No. 19-A*



**TYPE HS**

*Type HS Pump is recognized for its dependable low operating cost. Capacities range from 1,000 to 65,000 sq. ft. EDR and pressures from 10 to 75 pounds.*

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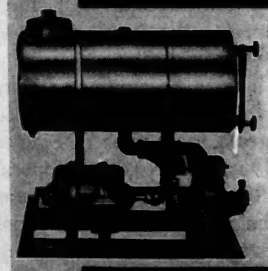
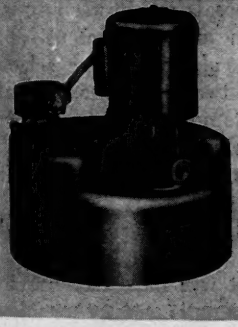


**TYPE TM**

*Type TM High Pressure Turbine Pump. Designed for pressures up to 150 pounds and boilers to 250 H.P.*

Write for *Bulletin No. 17*



**TYPE CV**

*Type CV Vertical Pump is ideal where space is limited. This model like every Skidmore Pump is built to meet specific requirements. For the correct solution to your own pump problem consult a Skidmore Heating Pump Specialist.*

Write for *Bulletin No. 21*

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**FANS**
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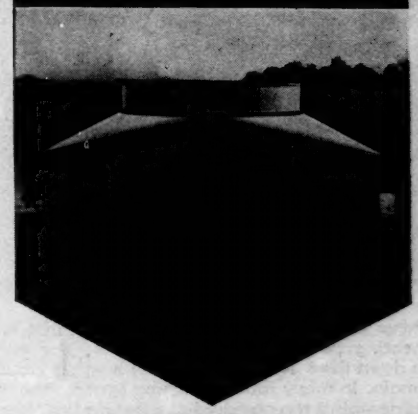

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## RADIANT HEATING

(*Continued from page* 126)

Fig. 5—After the pipe coils have been fabricated and tested, radiant heating panels are laid on top of the meshed wire used to tie down the asphalt paper. Panel is welded to the outside or return main. In many radiant heating systems the line closest to the outside wall is the one used as a return line, heated water coming into the panels from supply lines which run more in the center of the system.

Fig. 6—When the panels have been laid and all connections made, the concrete slab is poured, and the sub-structure is completed. Floors are finished off with asphalt tile. Two No. 968 Farrar and Tufts gas fired boilers were used with a rated capacity of 1,680,000 Btu per hr.

## DR. LEONARD GREENBURG

**appointed Commissioner of Air Pollution, New York. Long an expert on public health and air pollution.**

Dr. Leonard Greenburg, for the past 17 years executive director of the Industrial Division of Hygiene, New York State Department of Labor, was appointed last month Commissioner of Air Pollution for the City of New York. A bill creating the new department became effective November 24.

In an interview, Dr. Greenburg said: "There is no reason why New Yorkers shouldn't breathe air as clean as the air in Pittsburgh." In his opinion this could be done "through full co-operation of the public" without arousing resentment. "The battle against air pollution," he said, "is going on all over the country. It's an accepted thing."

"Marvelous work has been done in Pittsburgh to correct a very bad situation. As soon as possible, I'm going there, among other places, to make a first-hand study of what they have accomplished."

Dr. Greenburg, whose first degree was in sanitary engineering from Columbia later went on to obtain an M.D. degree from Yale. Prior to accepting his position with the State of New York, he was public health officer in New Haven, and prior to that was with the United States Public Health Service for fifteen years as an expert on air pollution. He is co-inventor of the Greenburg and Smith impinger apparatus for sampling air and in 1923-24 was in charge of the installation of a ventilation system in the House of Representatives and the Senate Chamber.

## NUCLEAR POWER

**studied by eleven companies joining with Dow Chemical and Detroit Edison in conjunction with the AEC.**

The Atomic Energy Commission has announced that security clearances will be granted to the personnel of eleven companies which will become associated with Dow Chemical and The Detroit Edison Companies in their joint study wth the commission for the development of a nuclear reactor to produce power.

• **PROPOSALS.**—The investigations to be conducted were proposed by the Dow-Detroit group for a jointly financed research and development program for a type of reactor to produce fissionable materials and power, the proposal being accepted by AEC last April. Three other groups have issued final reports on the feasibility of industrial participation in the reactor program which are being studied by AEC.

• **OWN LABS USED.**—The proposals are in keeping with AEC's power reactor program and will intensify the approach to improved reactors along the line selected. Most of the work by the original two companies, estimated at about $275,000 in direct costs not including overhead, will be carried out in their own laboratories. AEC research will be done in the special facilities of the national atomic energy laboratories.

• **PERSONNEL.**—The associated companies will provide qualified personnel to carry on the work. In most cases, the men assigned to the project will have had previous experience in some phase of atomic energy problems. Each company will assign one or more men on essentially a full time basis to work on the project and function as if they were regular employees of either Dow or Detroit Edison. Security clearances will also be granted to a limited number of engineering and management executives of the

(*Continued on page* 130)

# PRODUCT INFORMATION SERVICE

**Use the postage-free postcard below for further information on:**

- **News of Equipment and Materials**
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## NEW CATALOGS

**BOILER WATER CONDITIONING**
A 12-page catalog outlining difficulties caused through industrial water contamination; recommended water conditioning treatments for scale, sludge, corrosion, carryover and other boiler conditions; and efficient control methods is offered by E. F. Drew & Co., Inc., New York, N. Y. Details on its system of complete boiler water conditioning are explained. .....Item 35

**BOILER-BURNER MANUAL**
A new 32-page installing and servicing manual has been published by Aldrich Co., Wyoming, Ill. on boiler-burner hot water heating systems and hot water supply boilers. The manual, which contains 44 illustrations, clearly captioned diagrams and cut-away views showing internal construction, gives detailed specification charts on various household and heavy duty units, as well as a section that tells how to correct common boiler troubles. Book contains information that simplifies installation and servicing of both oil-fired and gas-fired boiler-burner heaters and hot water heaters. All parts and their functions are explained, with illustrated instructions on operation and adjustment....Item 36

**CENTRIFUGAL PUMP BULLETIN**
Bulletin 5286691A on its line of frame type centrifugal pumps, is available from Allis-Chalmers Mfg. Co., Milwaukee, Wis. Cross section diagrams of the three available types of frame type centrifugal pumps showing the units' rigid cast iron frame, two single row ball bearings, mechanical seal, and slinger and seal assembly, together with performance curves, are included in the bulletin. .....Item 37

**AUTOMATIC CONTROL BULLETIN**
Bulletin 3100, a 4-page folder describing the Autocon Floatrol float switch for open tanks or sumps in water, sewage, and industrial processing systems, has been offered by Automatic Control Co., St. Paul, Minn. The bulletin gives illustrations of typical models and methods of installation. .....Item 38

**CARTRIDGE TYPE DRIER FOLDER**
Bulletin 700, a 4-page folder on its line of cartridge type driers has been published by Henry Valve Co., Melrose Park, Ill. The bulletin catalogs various types of the cartridge driers, giving type numbers, sizes, list prices, volumes, horsepower rating, and similar design details. Cutaway views of each type of drier listed are shown.....Item 39

**RADIANT HEATING BROCHURE**
A 24-page brochure discussing radiant heating, examining what phases of the subject are theory, what practice, and what has been learned about both, is being distributed by Sarcotherm Controls, Inc., New York, N. Y. The brochure, written originally by T. Napier Adlam as a series of articles appearing in Heating and Ventilating, is divided into six main parts: theory, present methods of application, good and bad installation practice, design problems, comfort and heat loss, and floor temperatures. Illustrations, graphs, tables, and sample problems are included. Booklet is available to consulting engineers and heating contractors. .....Item 40

**EXPANSION JOINTS**
The recently redesigned Flexon line of expansion joints is featured in a new sixteen page illustrated two-color catalog, No. CMH-128, released by Flexonics Corp., Chicago, Ill. Complete specification and supporting data are given for new expansion joints, now offering increased traverse per corrugation. Also covered are complete specification and application information for CMH corrugated and convoluted types of flexible metal hose, including couplings, flanges, nipples, and assemblies. Installation instructions are included. .....Item 41

**CENTRIFUGAL PUMP DATA**
Form 7223, a new bulletin covering general purpose centrifugal pumps of the cradle-mounted type, has been issued by Ingersoll-Rand Company, New York, N. Y. It covers five basic cradle groups and 17 corresponding pump types, their capacities, horsepower ratings and uses. There are also two pages covering pump dimensions and a table of performance. In addition, two pages describing special purpose units and design modifications are included. .....Item 42

**INDUSTRIAL FAN BOOKLET**
Bulletin SA-6873 dealing with its line of fans ranging in size from 670 to 44,000 cfm at pressures up to 16-inches mercury, is available from Sturtevant Div., Westinghouse Electric Corp., Boston, Mass.. Eleven sizes of new industrial fans and their standard wheels are described in the 12-page booklet. Arrangements in which the fans may be obtained are shown and described. Accessories available and special features are pointed out. A table of maximum operating rpm's for various fan sizes and operating temperatures is presented.....Item 43

**WATER FOR AIR CONDITIONING**
A bulletin entitled Use of Water in Air Conditioning Systems has been issued by Water Service Laboratories, Inc., New York, N. Y. It discusses the use of recirculated water in the component parts of air conditioning systems, such as cooling towers and evaporative condensers, and describes the operating troubles directly arising from the impurities that are present in all natural waters, and it gives recommendations for overcoming these troubles. .....Item 44

**FLANGED, DISHED HEADS**
A new bulletin listing sizes of ASME and standard types of flanged and dished heads available for immediate shipment from stock is available from Joseph T. Ryerson & Son, Inc., Chicago, Ill. Heads are suitable for pressure vessels, tanks, boilers and other applications such as ladle and melting furnace bottoms, ends for annealing pots, concrete mixer and brake drums, bases for lamps and stands, gear and grinder guards, special wheels which call for an integral, continous flange on a circular steel plate.....Item 45

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Bulletin A-614-A offers in compact style full engineering information and selection data on the line of torque-arm speed reducers—and the new Dodge overload release, designed for use with the reducer, made by Dodge Mfg. Corp., Mishawaka, Ind. All data and tables have been revised to cover the new size 7 torque-arm speed reducer which increased the capacity range to 43 hp. Maximum capacity of the previous largest size was 37 hp. This new line of shaft-mounted reducers covers a speed range of 12 to 330 rpm. A new and quicker method of selection is included. . . . . **Item 46**

**CENTENNIAL HISTORY**

A 46-page booklet presenting its centennial history is issued by Frick Co., Waynesboro, Pa. Containing many illustrations, the booklet is divided into ten sections covering a decade each in the history, from its founding in 1853 to date. . . . . **Item 47**

**LIQUID FILTER BULLETIN**

Bulletin D-IL, a 12-page booklet describing its line of liquid filters is available from Dollinger Corp., Rochester, N. Y. The bulletin contains specifications, engineering and performance data, photos and descriptions of recommended types of filter media, and check list of liquids that can be filtered. . . . . **Item 48**

**VACUUM CLEANER CATALOG**

A new catalog showing the operation of the Nu-Vac vacuum cleaner is now available from Empire Chemical Products Co., Newark, N. J. The booklet lists the advantages, design details and auxiliary equipment of the product used for furnace maintenance. . . . . **Item 49**

**BOILER SPECIFICATIONS**

A new catalog, JR-10-1, for its recently improved R-Z-U Junior steel boiler line is issued by Fitzgibbons Boiler Co., New York, N. Y. The six-page catalog contains full specifications and dimensional data for the boilers when fired by oil, gas, stoker or hand-fired coal; outline drawings for all sizes; ratings for the new Tanksaver and Tankheater domestic hot water coils; and photographs to show the internal design, construction and features of the boiler. . . . . **Item 50**

**METAL FRAMING POCKET CATALOG**

A pocket size catalog, No. 800, designed for use by the worker on the job and as a handy reference guide for the architect, engineer, draftsman, contractor or builder, is now being distributed by Unistrut Products Co., Chicago, Ill. 3½ x 6 inches in size, it contains 84 pages of ideas, photographs, drawings and data on how to frame, hang, mount and support all kinds of mechanical and electrical equipment with its line of adjustable, all-purpose metal framing. Included are reference tables, graphical symbols and data covering weights and dimensions, warehouse and distributor locations, and complete ordering information. . . . . **Item 51**

**VERTICAL MOTORS**

Users of deep well turbine pumps will find interesting developments in vertical motor design in a 16-page bulletin Form F-1554, featuring U. S. Verticlosed motors, issued by U. S. Electrical Motors, Inc., Los Angeles, Calif. Numerous design improvements are presented. Bulletin dramatically illustrates the motor with accompanying drawings of individual features in full color. Engineering data includes discussions of tandem bearings, dual balancing of rotors and the complete motor assembly, use of automatic backstops for preventing the motor from spinning backward, comparisons of solid shaft and hollow-shaft designs, description of two types of lubrication and progressive views of pump motors showing their continous improvement during the past 40 years. The range of Verticlosed motors extends from 1½ to 400 hp. . . **Item 52**

**REFRIGERATION COMPRESSORS**

Bulletin DB 101-160 on hermetically-sealed refrigeration compressors and condensing units of 75 to 100 hp capacity is available from Sturtevant Div., Westinghouse Electric Corp., Boston, Mass. The 8-page bulletin gives data on CLS compressors and condensing units: the motors, valves, pistons, crank shafts, bearings, and other smaller parts are discussed with respect to the maunfacturing methods used to make them. In addition, lists of available accessories for condensing units are given. A brief table of specifications gives technical data on two sizes of compressors. The standard electrical characteristics are included. Two pages of line drawings give overall dimensions of both compressors and condensing units. . . . . **Item 53**

**UNIT HEATER BULLETIN**

A new 8-page bulletin, No. 231, listing the Btu output ratings for various models of 30 different makes of unit heaters is issued by Armstrong Machine Works, Three Rivers, Mich. This bulletin shows how to figure condensing rates, how to select unit heater traps, and gives hints on unit heater trapping. Included are tables for selecting traps for constant pressure and various pressure operation, and a table of constants for determining output of unit heaters at other than standard steam pressures and entering air temperatures. There is also a chart for determining heater outputs at various fan speeds. Physical data, capacities and prices are given. . . . . **Item 54**

**OIL BOOSTER BULLETIN**

Bulletin AD-108 on its new Peak-Temp oil booster has been announced by Road Machinery Div., Cleaver-Brooks Co., Milwaukee, Wis. The booster uses a high flash point oil as a heat transfer medium to try to get fast, low cost heating of oils, bituminous and heavy materials in storage tanks, bulk plants and refineries. Illustrated throughout, the bulletin points out the features of the booster and lists specifications. . . . . **Item 55**

**PRESSURE REGULATING VALVES**

Bulletin No. 535, on its line of steam pressure regulating valves has been issued by D'Este Div., Kaye & MacDonald, Inc., West Orange, N. J. Three new items, Type F, FR, and PR are introduced and complete sizing tables are included as well as a section on choosing a regulating valve. . . . . **Item 56**

**RADIATOR HEAT HANDBOOK**

Catalog R52 on radiator heating is being distributed by American Radiator & Standard Sanitary Corp., Pittsburgh, Pa. It is equipped with index tabs to enable the user to turn instantly to any section. All information about an individual product is in one place. Illustrated with portrait and cut-away views of products and dimensional drawings, the catalog contains ratings, technical data and dimensions of all radiator heating equipment made by the firm. It is divided into five main sections. The first deals with boilers, detailing construction features, ratings, dimensions, control combinations and other technical data for each boiler. Radiators of all types are covered in section two, including all types of baseboard panels, convectors and radiators. Section three presents information on conversion burners and water heaters while the fourth section of the book is devoted to controls and accessories. Technical information concerned in the application and installation of radiator heating equipment is contained in section five. . . . . **Item 57**

**INSULATED PIPING**

A 4-page folder covering its line of Hel-Cor insulated pipe units, sectional conduit systems, cast iron insulated pipe units, overhead insulated pipe systems, prefabricated utilidors, and prefabricated manholes has been published by The Ric-wiL Co., Cleveland, Ohio. Illustrations, applications, details, and descriptions of all items are included. . . **Item 58**

**FUEL MIXER HAS ADJUSTABLE JET**

Bulletin L-700, describing and giving specifications for its models of fuel mixers with adjustable orifices is issued by Eclipse Fuel Engineering Co., Rockford, Ill. The 4-page folder illustrates the four types available and lists capacities, sizes, and dimensions for the various models. . . . . **Item 59**

**INSTITUTIONAL BOOKLET**

A 31-page booklet entitled A Lot of Things Besides Pumps written and illustrated by cartoonist Don Herold has been published by Worthington Corp., Harrison, N. J. The booklet is a review of all the different products of the firm, illustrating each, and containing a detailed description of their applications. Included are cartoons by the author. . . . . **Item 60**

PLEASE SEND US MORE INFORMATION. Circle below item numbers on which you wish further information.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 1 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| 1 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 1 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |

Dec. H-52

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This card is void after March 1, 1953

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With

## REMOVABLE DIFFUSER CORE

There's something really new in air diffusers — removable, interchangeable cores . . . and only AGITAIR Type RC Series has it!

To assure 100% air distribution in any area, simply choose the correct, tailor-made core from the unlimited pattern possibilities . . . and insert into the mounting frame of your choice.

**Result for today:** efficient performance, attractive appearance, quick, easy installation.

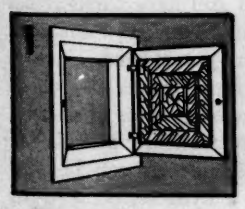
**Result for tomorrow:** when partitions are relocated, simply replace diffuser core with different pattern. No changes in frame or duct work necessary.

When you plan air distribution for the present, be sure to keep an eye on the future — specify AGITAIR Type RC—the diffuser that looks ahead.

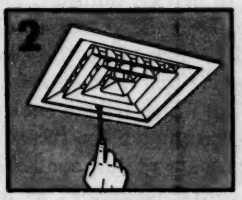
***Today:*** AGITAIR Type RC with four way core provides correct air distribution from center of room.

***Tomorrow:*** Walls are moved, the four way core snaps out and a three way core snaps in for correct air distribution from side of room.

### 1-2 YOU'RE THRU . . .




Insert diffuser "slip hinges" into frame slots




Turn mounting lock 90° with screw driver

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## NUCLEAR POWER

(*Continued from page* 128)

associated companies who will add their background and experience to the project.

• **OTHERS.**—Other companies which can make a contribution to development work on the project may become associated with it. AEC has reserved the right to designate or approve additonal associated companies. The new companies may affiliate with the three other existing study groups or create new groups. The other three existing groups are:

St. Louis; The Monsanto Chemical Co., and The Union Electric Co. of Missouri.
Chicago; The Commonwealth Edison Co., and Public Service Co. of Northern Illinois.
San Francisco; Pacific Gas and Electric Co., and Bechtel Corp.

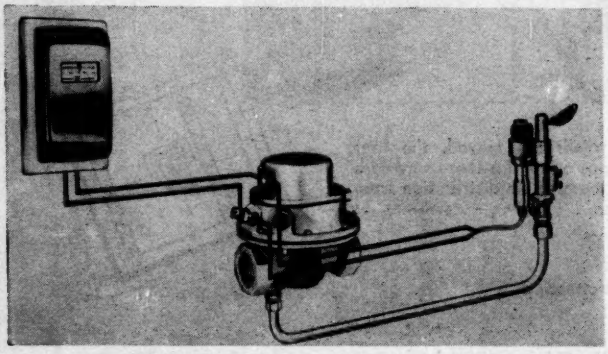
• **ASSOCIATED COMPANIES.**—The companies now associated with the Dow-Detroit study group are:

The Cincinnati Gas & Electric Co.
The Cleveland Electric Illuminating Co.
Consolidated Edison Co. of N. Y.
Consumers Power Co.
General Public Utilities Corp.
New England Electric System
Philadelphia Electric Co.
Public Service Electric and Gas Co. of N. J.
The Toledo Edison Co.
Vitro Corp. of America
Wisconsin Electric Power Co.

## ALL-GAS CONTROL

**first developed by W. A. Ray, General Controls Co., for automatic gas heating in non-electrified areas.**

The October issue of Heating and Ventilating erroneously stated, in an article entitled Gas-Fired Heating Equipment (pp 88-89), that the all-gas control system was developed by a large mid-western controls manufacturer. Actually this control was originated and developed by W. A. Ray, president of General Controls Co., Glendale, Calif.



B-60 self-generating control system consists of a thermostat, a pilot generator, and a gas valve.

• **PILOT GENERATOR.**—This company's B-60 self generating control system, introduced in 1938, consists of a thermostat, pilot generator, and gas valve, as shown in the illustration. The pilot generator provides the flame for lighting the main burner, and it is the source of electrical energy for operating the control system. It also is the means of safety shut-off of gas.

• **CONTROL VALVE.**—The gas control valve utilizes the electrical energy developed by the generator to control the flow of fuel to the main gas burner as directed by the thermostat. It consists of an electromagnetic pilot and a diaphragm type main valve. The valve will close automatically if current is interrupted by a control switch or an extinguished pilot flame as the electro-magnet releases the armature which closes vent jet and opens inlet jet, equalizing pressures above and below the diaphragm, allowing its weight to close the valve.

## ATOMIC FUEL

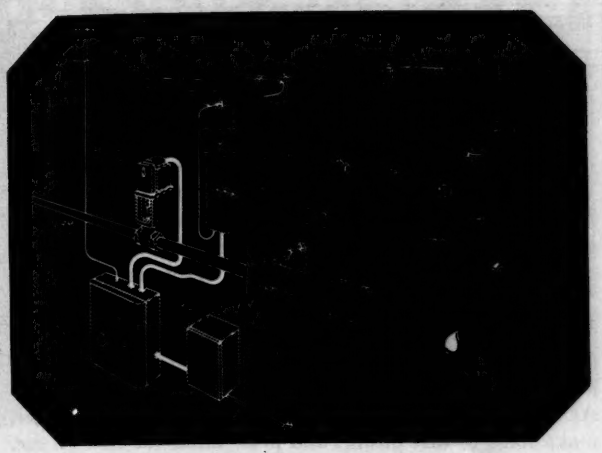
**may yet supplement conventional energy sources for usage in power producing and consuming industries.**

According to the Industrial Bulletin of Arthur D. Little, Inc., a guarded statement by the Atomic Energy Commission reports that recent experiments show that it may yet be possible to produce more fuel than is burned in the operation of a nuclear reactor. Such breeding of nuclear fuel has long been considered a theoretical possibility, and its realization would have important applications in both the power producing and power consuming industries. One AEC official has reported that the potential energy content of known workable sources of uranium substantially exceeds that in the world's reserves of coal and oil.

• **POWER COSTS.**—Most reports issued on the basis of present technology have indicated that the cost of power from nuclear energy would be substantially above that for power derived from conventional fuels. Breeding of nuclear fuel, however, might have a significant effect upon the economics of the process. According to one scheme, the operator of a successful breeder reactor would be able to make enough plutonium to sell to the Government for use in weapons or as a fuel in ship propulsion, to sell power to private industry, and still have enough fuel left over to keep the reaction going. Thus, raw material cost would be low, once the plant got started, since it would consume fuel derived from fertile materials, which are cheap, but which release enormous amounts of energy.

• **FUTURE.**—Although the future of nuclear power is far from clear, some of the controlling factors can be outlined. The initial plant cost, as in a hydro-electric plant, will comprise the largest part of the power cost. The nuclear plant, however, can be located wherever the power is most needed; the fuel is essentially weightless, so its geographical source does not matter. The Government will certainly play a large part in determining when and where to build the plant, who will build it, and how to sell its power. Military requirements force the present

(*Continued on page* 132)



## New Heating Comfort and Economy

### with the B & J Proportionator Control for Vapor Systems

With a B & J Proportionator system of heat control, there is a continuous flow of steam at all times exactly metered to meet the heat losses of the building. The flow of steam to each radiator is increased or decreased as the weather changes. The radiators are filled with steam only when there is a need for full heat. The steam is not completely cut off until the need for heating ceases. The changes in filling are smooth and gradual.

CONTINUOUS FLOW means CONTINUOUS COMFORT because there are no dead points. There is always enough heat to keep the convection currents in a room active. There is no "cold 70°" such as experienced with the "on and off" system. Heating comfort increased to a point never before experienced in hospitals, schools, colleges, commercial buildings and housing projects.

CONTINUOUS FLOW means CONTINUOUS ECONOMY because with the B & J Proportionator you use only the exact amount of steam that is required. CONTINUOUS LOW UPKEEP because the piping in the system is not subject to the frequent expansions and contractions caused by the stops and starts of an intermittent system. Fuel costs have been reduced in some cases up to 50%.

**Ask for** the new bulletin on B & J Vapor Control Systems and the bulletin on the B & J cage units which make new systems out of old without replacing the trap housings or the valve seats.

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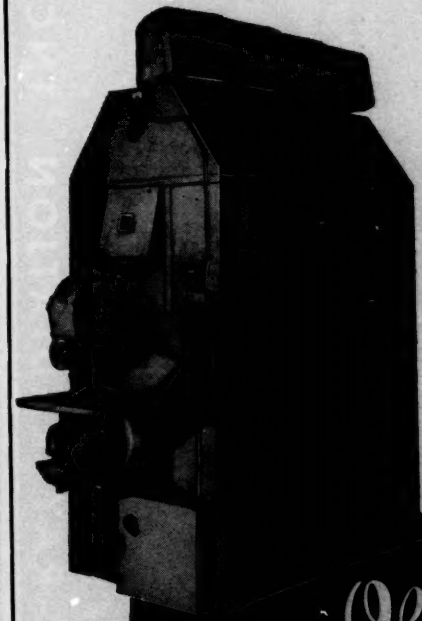
Olson, through the use of standard 10 gauge, 4" O. D. boiler tubes, gives more effective heat transfer surface than the highest recommendations of accepted heating authorities.



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## ATOMIC FUEL

(*Continued from page* 130)

concentration on nuclear power plants for propelling military aircraft and vessels. In the future, however, the plants, breeders of their own fuel, may bring cheaper power, and hence new industries, to areas now hampered by high fuel costs, or to remote locations rich in resources other than fuel.

• **PRESENT PLANS.**—At present, there are several proposals for the early construction of the specific nuclear power plants under consideration. One possibility is that AEC, as a consumer of tremendous amounts of power, make some of that power, and plutonium, for its own use. Another plan is that AEC build a sizable experimental plant to supply power to a Nevada mine which now uses large amounts at high cost. As a third approach, AEC would finance the construction of a reactor and chemical precessing plant, with an industrial company financing the power plant equipment. Whatever the ultimate plan, private nuclear power operations will require careful study and revision of the regulations which now give AEC monopoly control of fissionable materials.

---

**STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233) SHOWING THE OWNERSHIP, MANAGEMENT, AND CIRCULATION OF "HEATING AND VENTILATING" published monthly at New York, N. Y., for Oct. 1, 1952.**

1. The names and addresses of the publisher, editor, managing editor, and business managers are:
Publisher, The Industrial Press, 148 Lafayette St., New York 13, N. Y.
Editor, Clifford Strock, 148 Lafayette St., New York 13, N. Y.
Consulting Editor, Franklin D. Jones, 148 Lafayette St., New York 13, N. Y.

Business Managers, Robert B. Luchars, Edgar A. Becker and Harold L. Gray, 148 Lafayette St., New York 13, N. Y.

2. The owner is:
The Industrial Press, 148 Lafayette St., New York 13, N. Y.; Robert B. Luchars, 148 Lafayette St., New York 13, N. Y.; Edgar A. Becker, 148 Lafayette St., New York 13, N. Y.; Franklin D. Jones, 148 Lafayette St., New York 13, N. Y.; Walter E. Robinson, 148 Lafayette St., New York 13, N. Y.; Charles O. Herb, 148 Lafayette St., New York 13, N. Y.; Harold L. Gray, 148 Lafayette St., New York 13, N. Y.; Clifford Strock, 148 Lafayette St., New York 13, N. Y.; Suno E. Larson, 148 Lafayette St., New York 13, N. Y.; Helena E. Oberg, 65 82nd St., Brooklyn 9, N. Y.; First National Bank & Trust Co. of Montclair, and R. B. Luchars, Trustees (Beneficiaries Unknown), Upper Montclair, N. J.; First National Bank & Trust Co. of Montclair, and Leigh Roy Urban, Trustees (Beneficiaries Unknown), Upper Montclair, N. J.; First National Bank & Trust Co. of Montclair, and Kenneth D. Ketchum, Trustees (Beneficiaries Unknown), Upper Montclair, N. J.; Lee W. Urban, Guardian for Susan Yarnall Urban, 27 Clinton St., Oneonta, N. Y.; Lee W. Urban, Executrix of Will of Robert L. Urban, 27 Clinton St., Oneonta, N. Y.; John T. Urban, 224 Sullivan St., New York 12, N. Y.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are:

Charlotte B. Baldwin, 420 Clinton Ave., Brooklyn, N. Y.; Franklin D. Jones, 148 Lafayette St., New York 13, N. Y.; Robert B. Luchars, 148 Lafayette St., New York 13, N. Y.; Louis Pelletier, 148 Lafayette St., New York 13, N. Y.; Elizabeth Y. Urban, 38 Lakeview Road, Asheville, N. C.; Helen L. Ketchum, 231 King St., Cohasset, Mass.; Wilbert A. Mitchell, 28 Harlow Road, Springfield, Vt.; Henry V. Oberg, 3375 Kenmore Road, Shaker Heights 22, Ohio.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

EDGAR A. BECKER, Business Manager
Sworn to and subscribed before me this 22nd day of September, 1952.

MILDRED D. ALBERE,
Notary Public, State of New York, No. 52-0032100, Qualified in Suffolk County, Cert. filed with County Clerks, Suffolk, Kings and New York Certs. filed with City Reg. Kings and New York. Commission expires March 30, 1953.

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1. Double acting gate opens inward to regulate up-drafts and outward to relieve down-drafts.
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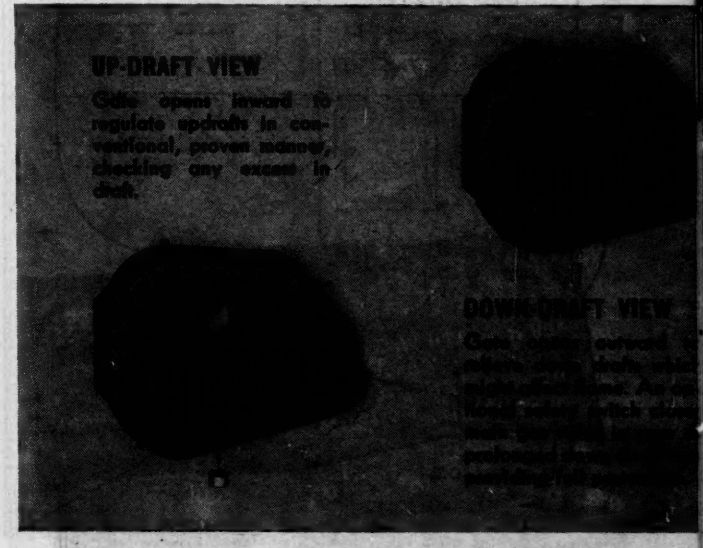

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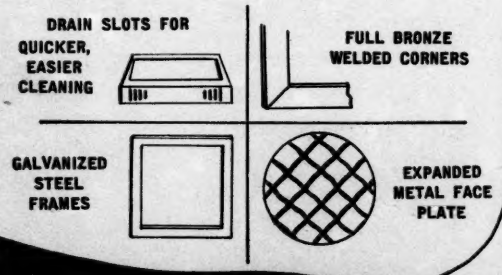
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**Canadian Degree-Days for September and October, 1952***

| City | September 1952 | September Normal | October 1952 | October Normal |
|---|---|---|---|---|
| Calgary, Alta. | 355 | 432 | 642 | 722 |
| Charlottetown, P. E. I. | 178 | 222 | 580 | 539 |
| Crescent Valley, B. C. | 235 | 360 | 564 | 698 |
| Edmonton, Alta. | 357 | 444 | 673 | 747 |
| Fort William, Ont. | 355 | 354 | 862 | 722 |
| Grande Prairie, Alta. | 402 | 480 | 645 | 812 |
| Halifax, N. S. | 171 | 189 | 461 | 499 |
| London, Ont. | 175 | 126 | 651 | 508 |
| Medicine Hat, Alta. | 215 | 267 | 536 | 601 |
| Moncton, N. B. | 253 | 282 | 611 | 595 |
| Montreal, P. Q. | 164 | 180 | 617 | 561 |
| North Bay, Ont. | 274 | 264 | 818 | 694 |
| Ottawa, Ont. | 210 | 204 | 695 | 595 |
| Penticton, B. C. | 159 | 213 | 465 | 527 |
| Porquis Junction, Ont. | 358 | 396 | 918 | 800 |
| Prince George, B. C. | 411 | 444 | 651 | 741 |
| Quebec City, P. Q. | 201 | 276 | 694 | 651 |
| Regina, Sask. | 319 | 408 | 812 | 794 |
| St. John, N. B. | 249 | 270 | 536 | 558 |
| Saskatoon, Sask. | 320 | 396 | 741 | 781 |
| Toronto, Ont. | 122 | 168 | 572 | 504 |
| Vancouver, B. C. | 192 | 234 | 407 | 459 |
| Victoria, B. C. | 226 | 264 | 369 | 446 |
| Windsor, Ont. | 114 | 54 | 546 | 425 |
| Winnipeg, Man. | 259 | 330 | 804 | 744 |

*These data are supplied through the courtesy of the Meteorological Division Air Service Branch, Department of Transport, Canada.

## GETTING PERSONAL

**Richard G. Lubinsky** (*Centrifugal Fan Selection*, page 75) is manager of the fan and heating coil department, The Trane Company, La Crosse, Wisconsin. A graduate of the University of Wisconsin with a degree in engineering, he has been with this company continuously since completing his formal education in 1935. During this period he has specialized in fan and coil application engineering, having been assistant department manager from 1941 to 1944, and manager of the department since that time. He is a member of ASHVE and a registered professional engineer in Wisconsin.

F. E. Ince

**F. Edward Ince** (*Operation and Maintenance of Air Conditioning Equipment*, page 80) sales application and research engineer for Marlo Coil Company, St. Louis, Mo., has had extensive experience in the air conditioning and refrigeration fields.

He studied electrical engineering at Missouri University and after some time with the research department of the Union Electric Company of St. Louis and as head of his own refrigeration service business, he joined Alco Valve Company in 1934 as laboratory engineer. For two years starting 1937 he was manager of the air conditioning division, R. H. Spangler Company.

Other work included divisional service engineer for

(*Continued on page* 136)

NOW IT'S UNBREAKABLE!

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*Flexible*
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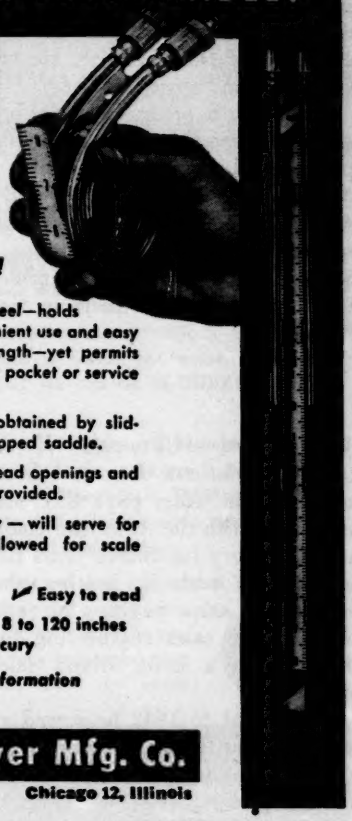

***Just roll it up and tuck it away!***

- ***Scale—convexed spring steel***—holds Slack-Tube rigid for convenient use and easy reading—regardless of length—yet permits rolling into small space for pocket or service kit
- ***Zero Adjustment***—easily obtained by sliding spring-steel scale in lipped saddle.
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- ***Tough Vinyl Plastic Body*** — will serve for years. Several inches allowed for scale adjustment.

✓ Extremely Accurate ✓ Easy to read

✓ Standard ranges from 8 to 120 inches in water or mercury

***Write for complete information***

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**MUCKLE VENTS**

**chase out foul, wet air!**

- Good looking
- Fit any roof
- Easy to install
- Motor out of line of air flow — for better performance in moisture filled air.

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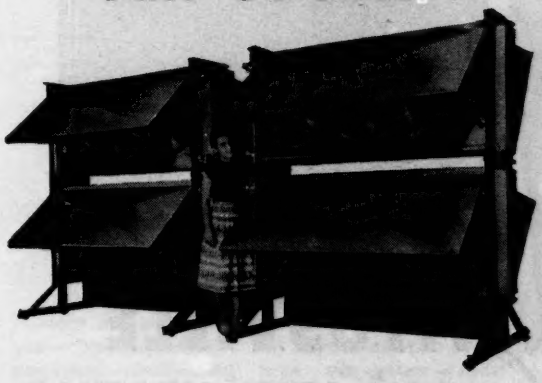
**3/4 TO 100 H.P.**
**CONDENSING**
***...without water!***

**ANY SIZE COMPRESSOR CAN BE AIR COOLED**

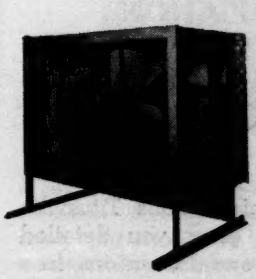


**40 TON**

**with**

**UNICON***

*by* **KRAMER**



Eliminates all water problems . . . because you don't use water with UNICON! Stands, hoods and wind deflectors are available for simplified outside mounting.

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✓ COMPACT
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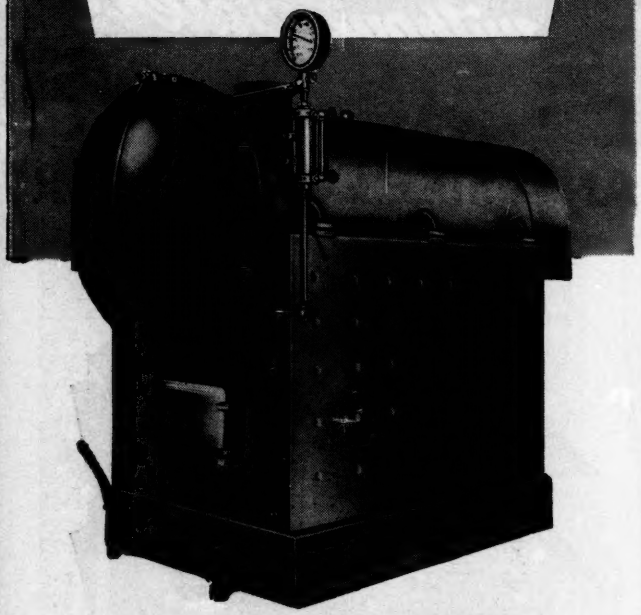
✓ Engineered for Better Service



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✓ AUTOMATIC WELDING
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—burns all fuels efficiently

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—quick access to tubes

✓ MANY OTHER FEATURES

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THE TITUSVILLE IRON WORKS COMPANY
A division of Struthers Wells
Representatives in Principal Cities
TITUSVILLE, PENNSYLVANIA

(*Continued from page* 134)

City of St. Louis Iron Fireman Corporation; sales manager and later chief engineer for Kennard Corporation; design engineer with Giffels and Vallet, Inc., consulting engineers of Detroit, Mich. He has been with the Marlo Coil Company since 1949.

Mr. Ince, a professional engineer, registered in Missouri, is a member of the state and national societies of professional engineers. He also is a member of the American Society of Heating and Ventilating Engineers, American Society of Refrigerating Engineers and Refrigeration Service Engineers Society. He is vice chairman of the St. Louis section and chairman of National Technical Sub-Committee 2.6, American Society of Refrigerating Engineers.

R. L. Stinard

**R. L. Stinard** (*Ultra-safe Heat Loss Calculations Increase Costs and Halt Building*, page 83) was associated with the American Radiator Company for twelve years doing design work in heating and ventilating, sales engineering and in charge of sales engineering for the company's Long Island sales office.

From 1941 to 1942 he served as heating, ventilating and air conditioning engineer with Wolf & Munier, Inc., engineers and contractors, New York City. After a two-year period with the New York District Engineer Office of the War Department, he was application and sales engineer with Trane Company in the New York City office, and chief mechanical engineer with Tishman Realty & Construction Company.

In May, 1950, he opened his own consulting engineer's office in New York City, covering work in heating, ventilation, air conditioning, refrigeration, process piping and plumbing fields.

Mr. Stinard is a professional engineer, licensed in New York and New Jersey, and is a member of the National Society of Professional Engineers as well as the American Society of Heating and Ventilating Engineers.

J. A. Cable

**John A. Cable** (*Selection of Centrifugal Pumps*, page 85) application engineer in the Norwood, Ohio, pump section of Allis-Chalmers Manufacturing Company, joined the concern's West Allis, Wis., Works in 1935 as a drafting apprentice in the pump department.

He served more than three years in the armed forces during World War II, and upon his return to Allis-Chalmers, he was assigned to the centrifugal pump sales department as an engineers' assistant. He was transferred to his present post at the Norwood Works in June 1952.

Mr. Cable received his technical training at the University of Wisconsin Extension Division in Milwaukee, Wis.

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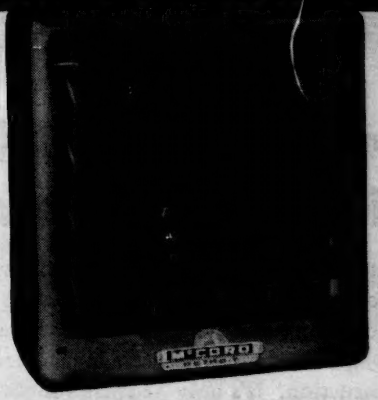
# McCORD

## HEATING AND AIR CONDITIONING PRODUCTS

### HORIZONTAL TYPE UNIT HEATERS



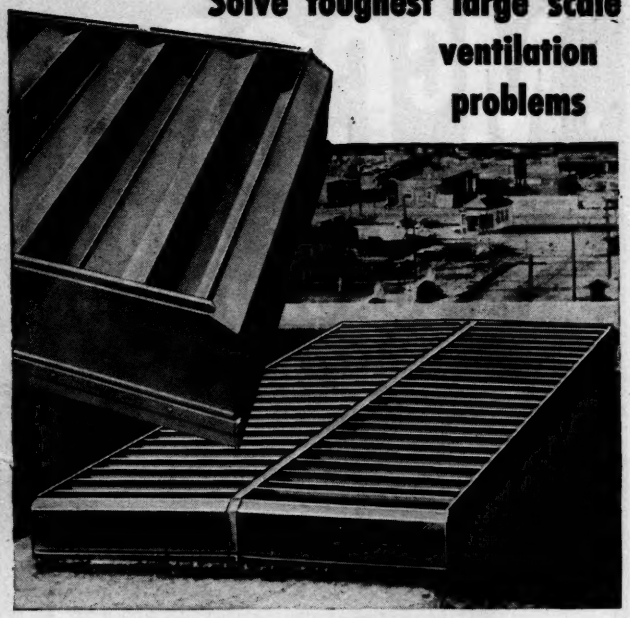
Modern design—top performance—thousands in use—dependable heat. All copper coils to resist corrosion — individual tube expansion — most rugged construction — quiet operation — easy installation—standard motors with standard bases. Sizes to 272,000 B.T.U. capacity.

### VERTICAL TYPE UNIT HEATERS

A proven heating unit—all copper coils to resist corrosion. McCord spiral tube fin construction creates air turbulence without undue restriction. Improved fan delivers large volume of air, with minimum air noise. All McCord heaters are guaranteed for use with 150 lbs, saturated steam pressure. Sizes to 575,000 B.T.U. capacity.

McCORD CORPORATION
DETROIT 11, MICH.

## Solve toughest large scale ventilation problems



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You can have all the ventilation you want—at economical cost. Airmover exhausts large quantities of heat, smoke or fumes rapidly through its short-air-travel, low-air-friction construction. It's only 32 inches high, built in rectangular units that can be placed on any type roof.

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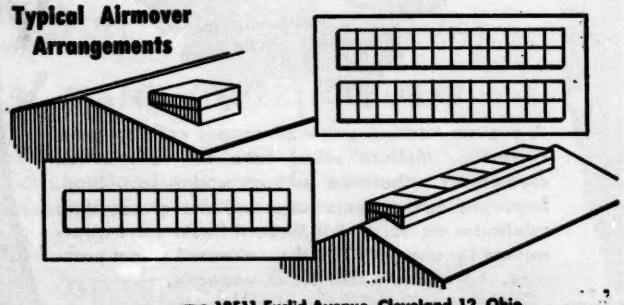
*The Swartwout Line includes a variety of gravity and powered ventilators.*

**Typical Airmover Arrangements**



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The Swartwout Co.

**Roof Ventilators and Ventilating Louvers**

POWER PLANT EQUIPMENT • PROCESS INDUSTRY CONTROLS


# COMING EVENTS

**Where listed, names or titles of individuals are those from whom further information is available.**

**CHEMICAL ENGINEERS MEETING**—Annual meeting of the American Institute of Chemical Engineers, at the Cleveland and Carter Hotels, Cleveland, Ohio. Stephen Tyler, secretary of the Institute, 120 E. 41st Street, New York, N. Y. ..... **DECEMBER 7-10, 1952.**

**AUTOMOTIVE ENGINEERS MEETING**—Annual meeting and engineering display of the Society of Automotive Engineers, at at the Sheraton-Cadillac Hotel, Detroit, Mich. John A. C. Warner, secretary and general manager, 29 West 39th St., New York, N. Y. ..... **JANUARY 12-16 1953.**

**PLANT MAINTENANCE SHOW AND CONFERENCE**—Plant Maintenance show and conference at the Public Auditorium, Cleveland, Ohio. Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y. ..... **JANUARY 19-22, 1953.**

**ASHVE EXPOSITION**—The Air Conditioning Exposition, under the auspices of The American Society of Heating and Ventilating Engineers, at the International Amphitheatre, Chicago, Ill. Write to exposition management, International Exposition Co., Inc., Grand Central Palace, New York 17, N. Y. ..... **JANUARY 26-30, 1953.**

**ASHVE MEETING**—59th annual meeting of the American Society of Heating and Ventilating Engineers, at the Conrad Hilton Hotel, Chicago, Ill. A. V. Hutchinson, secretary of the Society, 62 Worth St., New York 13, N. Y. ..... **JANUARY 26-30, 1953.**

**HEATING WHOLESALERS MEETING**—The annual meeting of the National Heating Wholesalers Association, Inc., at the Congress Hotel, Chicago, Ill. E. L. Wyman, executive secretary of the Association, 637 Union Commerce Building, Cleveland 14, Ohio ..... **JANUARY 28-30, 1953.**

**TESTING MATERIALS MEETING**—Spring meeting of the American Society for Testing Materials, at the Hotel Statler, Detroit, Mich. Secretary of the Society, 1916 Race St., Philadelphia 3, Pa. ..... **MARCH 2-6, 1953.**

**CORROSION ENGINEERS EXHIBIT**—1953 conference and exhibition of the National Association of Corrosion Engineers, at the Hotel Sherman, Chicago, Ill. Executive secretary of the Association, 1061 M & M Bldg., Houston 2, Texas. ..... **MARCH 16-20, 1953.**

**MICHIGAN ENGINEERING MEETING**—Annual meeting of the Michigan Engineering Society, at the Kellogg Center Hotel on Michigan State College Campus, East Lansing, Mich. Joseph E. Wilbur, executive secretary of the Society, Rackham Memorial Bldg., Detroit 2, Mich. ..... **APRIL 10-11, 1953.**

**MATERIALS HANDLING EXPOSITION**—5th National Materials Handling Exposition, sponsored by The Material Handling Institute, at Convention Hall, Philadelphia, Pa. A series of conferences to be held by the Ameircan Materials Handling Society concurrently with the exposition. Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y. ... **MAY 18-22, 1953.**

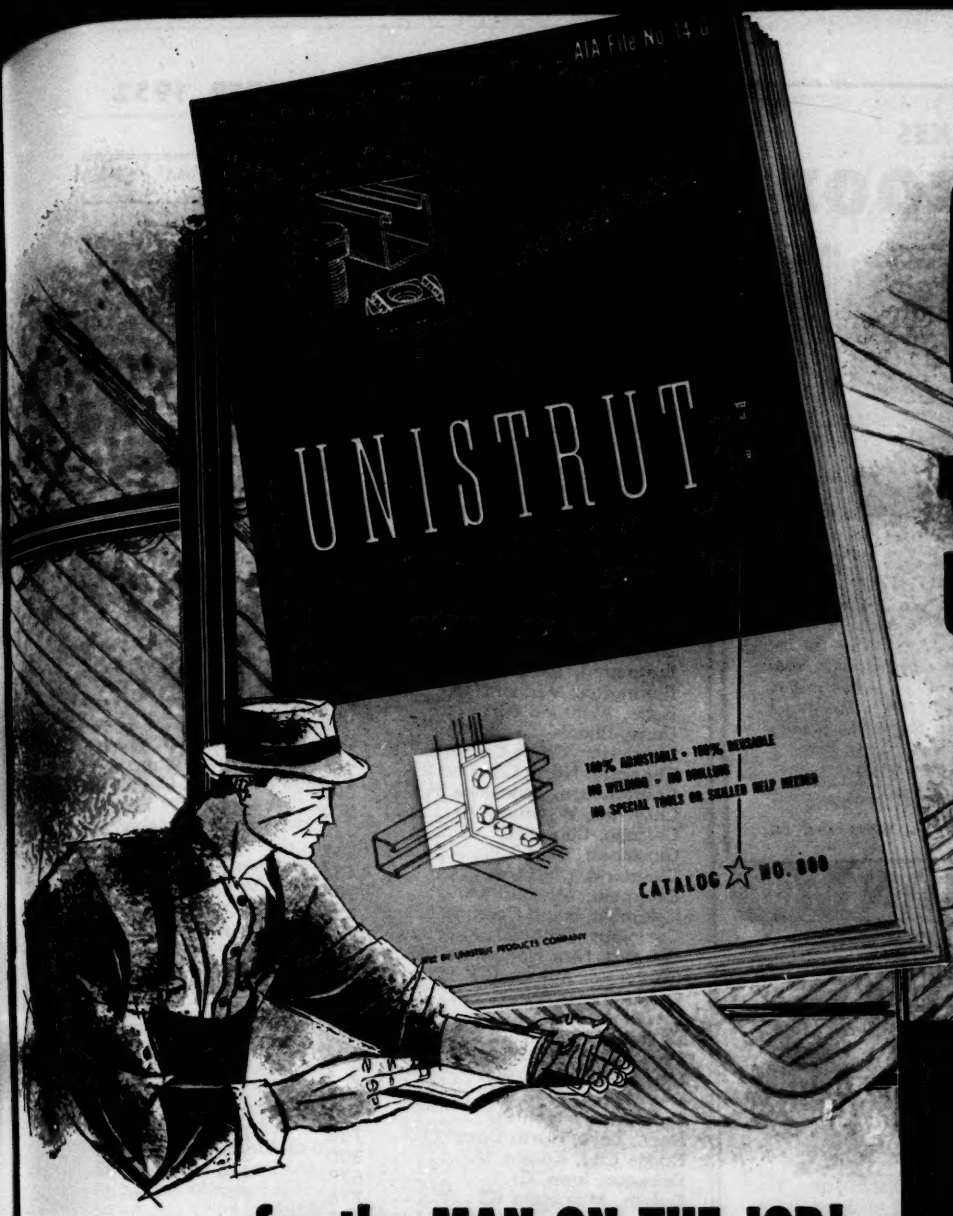
**GAMA MEETING**—Annual meeting of the Gas Appliance Manufacturers Association, at The Greenbrier Hotel, White Sulphur Springs, West Va. H. Leigh Whitelaw, managing director, 60 E. 42nd St., New York N. Y. ..... **MAY 20-22, 1953.**

**NDHA MEETING**—44th annual meeting of the National District Heating Association, at Lookout Mountain Hotel, Chattanooga, Tenn. John F. Collins, secretary of the Association, 827 N. Euclid Ave., Pittsburgh 6, Pa. ..... **JUNE 9-12, 1953.**

**TESTING MATERIALS MEETING**—Annual meeting of the American Society for Testing Materials, at the Chalfonte-Haddon Hall, Atlantic City, N. J. Secretary of the Society, 1916 Race St., Philadelphia 3, Pa. ..... **JUNE 21-25, 1953.**

**INSTRUMENT EXHIBIT**—8th National Instrument Conference and Exhibit of the Instrument Society of America, in Chicago, Ill. John McCaffery, assistant executive secretary of the Society, 1319 Allegheny Ave., Pittsburgh 33, Pa. ..... **SEPTEMBER 21-25, 1953.**

**AGA CONFERENCE**—Annual conference of the Amecrian Gas Association, at Kiel Auditorium, St. Louis, Mo. Secretary of the Association, 420 Lexington Ave., New York, N. Y. ..... **OCTOBER 26-29, 1953.**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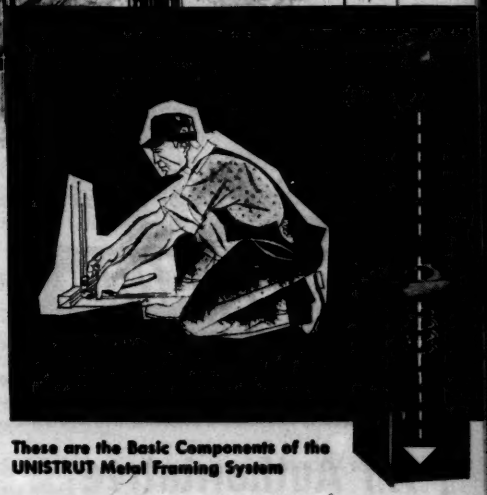

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*BULLETIN 152*

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**ENGINEERING DATABOOK**

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HEATING AND VENTILATING, 148 Lafayette St., N. Y. 13

# DEGREE-DAYS FOR OCTOBER, 1952

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city.

HEATING AND VENTILATING'S 25th Year of Publication of Monthly Degree-Day Data

| City | October | | |
|---|---|---|---|
| | 1952 | 1951 | Normal |
| Abilene, Texas (A) | 127 | 77 | 0 |
| Albany, New York (A) | 566 | 418 | 72 |
| Albuquerque, New Mexico (A) | 134 | 200 | 273 |
| Alpena, Michigan (C) | 634 | 513 | 570 |
| Anaconda, Montana (C) | 399 | 764 | 647 |
| Asheville, North Carolina (C) | 355 | 195 | 276 |
| Atlanta, Georgia (C) | 202 | 73 | 96 |
| Atlantic City, New Jersey (C) | 300 | 157 | 588 |
| Augusta, Georgia (A) | 199 | 37 | 16 |
| Baker, Oregon (C) | 353 | 597 | 552 |
| Baltimore, Maryland (C) | 264 | 148 | 223 |
| Billings, Montana (A) | 427 | 620 | 524 |
| Binghamton, New York (C) | 515 | 362 | 453 |
| Birmingham, Alabama (A) | 267 | 86 | 0 |
| Bismarck, North Dakota (A) | 642 | 680 | 626 |
| Block Island, Rhode Island (A) | 343 | 264 | 279 |
| Boise, Idaho (A) | 247 | 482 | 434 |
| Boston, Massachusetts (A) | 368 | 309 | 363 |
| Bozeman, Montana (C) | 505 | 727 | 651 |
| Buffalo, New York (A) | 569 | 348 | 419 |
| Burlington, Iowa (A) | 501 | 333 | (a) |
| Burlington, Vermont (A) | 594 | 459 | 481 |
| Butte, Montana (C) | 506 | 828 | 655 |
| Cairo, Illinois (C) | 310 | 155 | 158 |
| Charleston, South Carolina (C) | 101 | 17 | 0 |
| Charlotte, North Carolina (C) | 250 | 91 | 115 |
| Chattanooga, Tennessee (A) | 305 | 111 | 105 |
| Cheyenne, Wyoming (A) | 507 | 650 | 605 |
| Chicago, Illinois (C) | 434 | 319 | 326 |
| Cincinnati, Ohio (C) | 367 | 191 | 254 |
| Cleveland, Ohio (A) | 486 | 265 | 366 |
| Columbia, Missouri (A) | 388 | 256 | 260 |
| Columbia, South Carolina (C) | 177 | 35 | 31 |
| Columbus, Ohio (C) | 471 | 248 | 313 |
| Concord, New Hampshire (A) | 554 | 465 | 484 |
| Concordia, Kansas (C) | 344 | 345 | 276 |
| Dallas, Texas (A) | 144 | 56 | 0 |
| Davenport, Iowa (C) | 473 | 237 | 363 |
| Dayton, Ohio (A) | 490 | 280 | 273 |
| Deer Lodge, Montana (C) | 603 | 720 | 733 |
| Denver, Colorado (C) | 354 | 513 | 480 |
| Des Moines, Iowa (A) | 497 | 403 | 357 |
| Detroit, Michigan (A) | 521 | 332 | 400 |
| Devils Lake, North Dakota (C) | 730 | 768 | 706 |
| Dodge City, Kansas (A) | 300 | 350 | 276 |
| Dubuque, Iowa (C) | 629 | 459 | 409 |
| Duluth, Minnesota (C) | 776 | 707 | 626 |
| Eastport, Maine (A) | 534 | 485 | 543 |
| Elkins, West Virginia (A) | 579 | 341 | 378 |
| El Paso, Texas (A) | 47 | 21 | 40 |
| Ely, Nevada (A) | 439 | 672 | (a) |
| Erie, Pennsylvania (C) | 478 | 272 | 378 |
| Escanaba, Michigan (C) | 694 | 586 | 591 |
| Evansville, Indiana (A) | 408 | 226 | 155 |
| Fargo, North Dakota | 711 | 665 | 607 |
| Fort Smith, Arkansas (A) | 274 | 115 | 62 |
| Fort Wayne, Indiana (A) | 553 | 328 | 347 |
| Fort Worth, Texas (A) | 107 | 52 | 0 |
| Fresno, California (A) | 18 | 89 | 19 |
| Galveston, Texas (C) | 33 | 0 | 0 |
| Grand Junction, Colorado (A) | 231 | 383 | 369 |
| Grand Rapids, Michigan (A) | 555 | 371 | 419 |
| Green Bay, Wisconsin (C) | 720 | 533 | 505 |
| Greensboro, North Carolina (A) | 332 | 134 | 143 |
| Greenville, South Carolina (A) | 206 | 75 | 146 |
| Harrisburg, Pennsylvania (A) | 423 | 274 | 329 |
| Hartford, Connecticut (A) | 432 | 331 | 344 |
| Hatteras, North Carolina (C) | 96 | 16 | 0 |
| Havre, Montana (C) | 564 | 727 | 620 |
| Helena, Montana (A) | 563 | 730 | 614 |
| Houston, Texas (C) | 51 | 1 | 0 |
| Huron, South Dakota (A) | 600 | 580 | 123 |
| Indianapolis, Indiana (A) | 472 | 281 | 298 |
| Jackson, Mississippi (A) | 217 | 57 | (a) |
| Kansas City, Missouri (A) | 312 | 279 | 219 |
| Knoxville, Tennessee (A) | 284 | 145 | 183 |
| La Crosse, Wisconsin (A) | 612 | 445 | 462 |
| Lander, Wyoming (A) | 457 | 661 | 654 |

(a) Data not available.

| City | October | | |
|---|---|---|---|
| | 1952 | 1951 | Normal |
| Lansing, Michigan (A) | 628 | 408 | 481 |
| Lewiston, Maine (O) | 496 | 465 | 501 |
| Lincoln, Nebraska (C) | 404 | 372 | 316 |
| Little Rock, Arkansas (A) | 264 | 120 | 47 |
| Livingston, Montana (C) | 458 | 703 | 523 |
| Los Angeles, California (C) | 13 | 14 | 0 |
| Louisville, Kentucky (A) | 411 | 224 | 186 |
| Lynchburg, Virginia (A) | 338 | 179 | 220 |
| Macon, Georgia (A) | 150 | 32 | 6 |
| Madison, Wisconsin (C) | 574 | 454 | 459 |
| Marquette, Michigan (C) | 680 | 597 | 567 |
| Memphis, Tennessee (A) | 326 | 134 | 62 |
| Meridian, Mississippi (A) | 252 | 67 | 22 |
| Milwaukee, Wisconsin (A) | 573 | 411 | 450 |
| Minneapolis, Minnesota (A) | 633 | 506 | 481 |
| Moline, Illinois (A) | 565 | 350 | (a) |
| Montgomery, Alabama (A) | 170 | 35 | 0 |
| Nantucket, Massachusetts (A) | 349 | 291 | 335 |
| Nashville, Tennessee (A) | 377 | 165 | 136 |
| New Haven, Connecticut (A) | 411 | 308 | 360 |
| New Orleans, Louisiana (C) | 68 | 7 | 0 |
| New York, New York (C) | 325 | 212 | 272 |
| Newark, New Jersey (A) | 360 | 239 | 245 |
| Norfolk, Virginia (C) | 179 | 63 | 99 |
| North Head, Washington (C) | 278 | 354 | 366 |
| North Platte, Nebraska (A) | 522 | 520 | 434 |
| Oakland, California (C) | 146 | 123 | 183 |
| Oklahoma City, Oklahoma (C) | 187 | 171 | 105 |
| Omaha, Nebraska (A) | 445 | 387 | 329 |
| Oswego, New York (C) | 513 | 355 | 459 |
| Parkersburg, West Virginia (C) | 418 | 248 | 285 |
| Peoria, Illinois (A) | 514 | 334 | 381 |
| Philadelphia, Pennsylvania (C) | 295 | 170 | 235 |
| Phoenix, Arizona (C) | 0 | 8 | 0 |
| Pittsburgh, Pennsylvania (C) | 411 | 220 | 313 |
| Pocatello, Idaho (A) | 387 | 586 | 499 |
| Portland, Maine (A) | 564 | 491 | 477 |
| Portland, Oregon (C) | 126 | 290 | 332 |
| Providence, Rhode Island (C) | 364 | 277 | 348 |
| Pueblo, Colorado (A) | 354 | 462 | 388 |
| Raleigh, North Carolina (C) | 244 | 86 | 130 |
| Rapid City, South Dakota (A) | 454 | 563 | 515 |
| Reading, Pennsylvania (C) | 366 | 228 | 669 |
| Red Bluff, California (A) | 13 | 78 | (a) |
| Reno, Nevada (A) | 330 | 558 | 453 |
| Richmond, Virginia (C) | 281 | 138 | 161 |
| Rochester, New York (A) | 548 | 365 | 431 |
| Roswell, New Mexico (A) | 200 | 112 | 186 |
| Sacramento, California (C) | 53 | 82 | 71 |
| St. Joseph, Missouri (A) | 402 | 328 | 248 |
| St. Louis, Missouri (C) | 315 | 211 | 205 |
| Salt Lake City, Utah (A) | 231 | 443 | 388 |
| San Antonio, Texas (A) | 61 | 2 | 0 |
| San Diego, California (A) | 21 | 17 | 34 |
| Sandusky, Ohio (C) | 441 | 255 | 353 |
| San Francisco, California (C) | 200 | 123 | 146 |
| Sault Ste. Marie, Michigan (A) | 754 | 615 | 623 |
| Savannah, Georgia (A) | 115 | 19 | 0 |
| Scranton, Pennsylvania (C) | 477 | 334 | 397 |
| Seattle, Washington (C) | 232 | 346 | 394 |
| Sheridan, Wyoming (A) | 488 | 646 | 636 |
| Shreveport, Louisiana (A) | 184 | 39 | 0 |
| Sioux City, Iowa (A) | 530 | 457 | 415 |
| Spokane, Washington (A) | 320 | 591 | 515 |
| Springfield, Illinois (C) | 386 | 260 | 282 |
| Springfield, Missouri (A) | 383 | 254 | 217 |
| Syracuse, New York (A) | 516 | 377 | 425 |
| Tacoma, Washington (C) | 290 | 401 | 400 |
| Terre Haute, Indiana (A) | 461 | 274 | 233 |
| Toledo, Ohio (A) | 528 | 325 | 369 |
| Topeka, Kansas (C) | 321 | 308 | 236 |
| Trenton, New Jersey (C) | 367 | 232 | 242 |
| Utica, New York (O) | 563 | 390 | 430 |
| Valentine, Nebraska (C) | 520 | 544 | 490 |
| Walla Walla, Washington (C) | 166 | 372 | 332 |
| Washington, D. C. (C) | 295 | 152 | 251 |
| Wichita, Kansas (A) | 276 | 293 | 192 |
| Williston, North Dakota (C) | 614 | 695 | 660 |
| Winnemucca, Nevada (C) | (a) | 593 | 507 |
| Yakima, Washington (A) | 279 | 515 | 437 |

(a) Data not available.

Figures in this table, with seven exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Rees, Bursar, Bates College, Lewiston, Me., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company.


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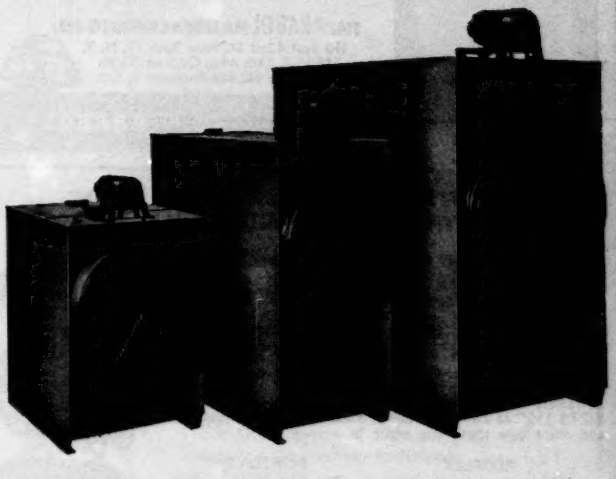
COOLING TOWERS



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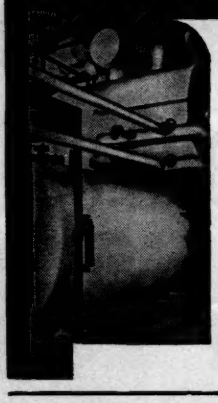

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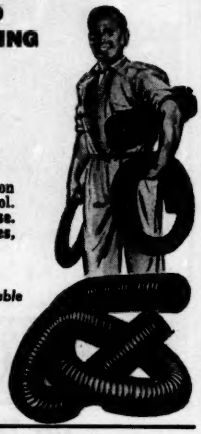

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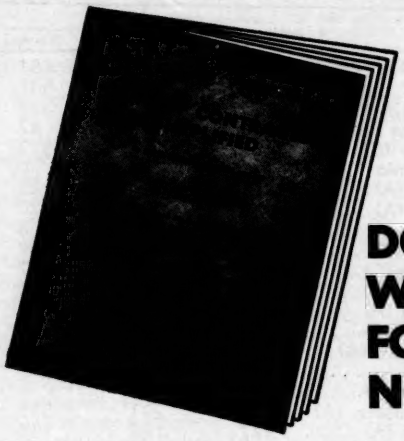

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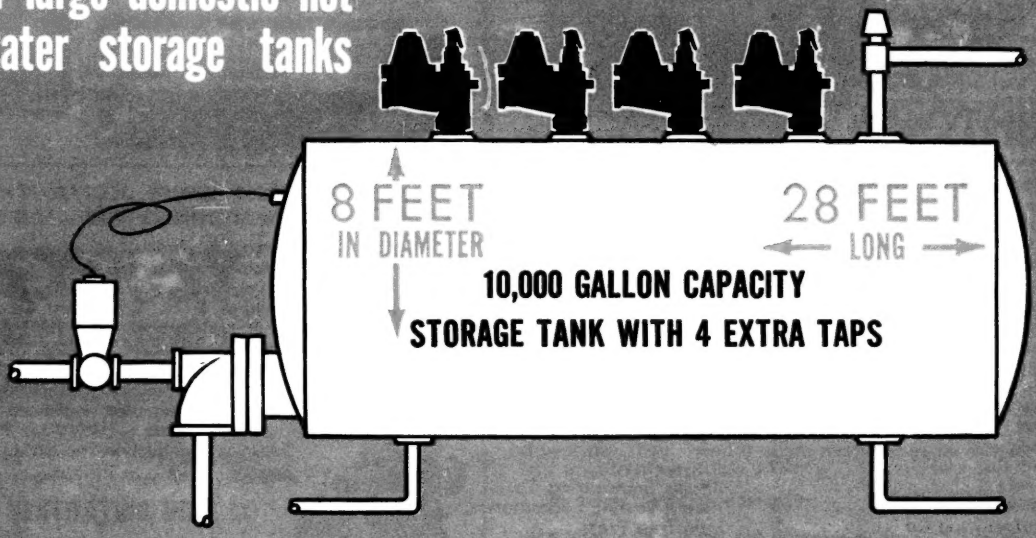
# BIG INSTALLATIONS

## of large domestic hot water storage tanks

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**WATTS REGULATOR COMPANY** LAWRENCE, MASSACHUSETTS

*Automatic*

• TEMPERATURE *and* PRESSURE REGULATING SAFETY DEVICES •

# UNIT CHECKING FACTORS FOR COMMERCIAL AIR CONDITIONING

**TABLE 1—DESIGN DATA FOR COMMERCIAL AIR CONDITIONING**

| Application | Range | Total Btu per Hr per Sq Ft | People per Ton | Cfm per Sq Ft | Sq Ft per Person | Watts per Sq Ft |
|---|---|---|---|---|---|---|
| Apartments and hotel guest rooms | Low | 13 | 1.4 | 0.5 | 100 | 0.2 |
| | Avg. | 20 | 1.7 | 0.7 | 175 | 0.6 |
| | High | 30 | 2.2 | 0.9 | 325 | 0.9 |
| Art museums and libraries | Low | 30 | 2.5 | 0.9 | 40 | 0.5 |
| | Avg. | 51 | 4.3 | 1.6 | 60 | 1.0 |
| | High | 75 | 8.3 | 2.1 | 80 | 2.0 |
| Bank areas | Low | 35 | 2.5 | 1.1 | 26 | 0.9 |
| | Avg. | 53 | 4.7 | 1.8 | 53 | 2.9 |
| | High | 75 | 7.5 | 2.5 | 80 | 4.4 |
| Barber shops | Low | 45 | 2.9 | 1.3 | 20 | 0.6 |
| | Avg. | 73 | 4.9 | 2.6 | 40 | 1.4 |
| | High | 112 | 7.4 | 4.4 | 60 | 4.6 |
| Beauty shops | Low | 49 | 2.5 | 1.6 | 17 | 2.7* |
| | Avg. | 75 | 4.3 | 2.3 | 42 | 4.2* |
| | High | 114 | 7.1 | 3.0 | 75 | 9.3* |
| Clothing stores, children's | Low | 39 | 1.4 | 1.1 | 48 | 1.1 |
| | Avg. | 41 | 3.1 | 1.8 | 96 | 1.6 |
| | High | 42 | 5.9 | 3.2 | 130 | 2.5 |
| Clothing stores, men's | Low | 33 | 1.2 | 0.9 | 60 | 1.0 |
| | Avg. | 45 | 3.0 | 1.4 | 118 | 2.2 |
| | High | 85 | 6.2 | 1.8 | 205 | 4.4 |
| Clothing stores, women's | Low | 30 | 2.5 | 0.8 | 22 | 0.8 |
| | Avg. | 43 | 5.7 | 2.4 | 61 | 3.3 |
| | High | 65 | 11.0 | 6.9 | 107 | 7.4 |
| Clothing stores, general | Low | 29 | 3.2 | 0.9 | 27 | 1.5 |
| | Avg. | 44 | 5.2 | 1.4 | 65 | 2.2 |
| | High | 68 | 7.0 | 2.1 | 111 | 3.5 |
| Department stores, basement floors | Low | 20 | 6.2 | 0.5 | 20 | 0.8 |
| | Avg. | 30 | 8.0 | 0.8 | 30 | 2.4 |
| | High | 39 | 15.0 | 1.2 | 95 | 3.9 |
| Department stores, main floors | Low | 25 | 2.0 | 0.9 | 16 | 0.7 |
| | Avg. | 42 | 6.0 | 1.3 | 35 | 2.5 |
| | High | 62 | 7.0 | 2.0 | 90 | 5.2 |
| Doctors' and dentists' offices | Low | 33 | 1.3 | 1.2 | 29 | 1.4 |
| | Avg. | 51 | 4.0 | 1.7 | 75 | 1.7 |
| | High | 68 | 7.0 | 2.4 | 160 | 3.4 |
| Drug stores | Low | 35 | 1.3 | 1.1 | 17 | 0.2 |
| | Avg. | 70 | 4.5 | 1.9 | 39 | 1.6 |
| | High | 109 | 6.9 | 3.4 | 92 | 3.9 |
| Food stores | Low | 44 | 3.0 | 1.3 | 12 | 0.9 |
| | Avg. | 82 | 5.3 | 2.5 | 36 | 2.6 |
| | High | 142 | 7.9 | 4.8 | 72 | 5.0 |
| Offices, private and general | Low | 22 | 1.2 | 0.7 | 32 | 0.6 |
| | Avg. | 43 | 3.5 | 1.4 | 105 | 2.0 |
| | High | 72 | 6.3 | 2.2 | 278 | 4.8 |
| Restaurants | Low | 62 | 3.4 | 0.8 | 9 | 0.2 |
| | Avg. | 115 | 7.0 | 2.1 | 18 | 1.4 |
| | High | 260 | 11.1 | 3.8 | 32 | 6.8 |
| Specialty stores, miscellaneous | Low | 22 | 1.1 | 0.8 | 20 | 0.9 |
| | Avg. | 52 | 3.1 | 1.9 | 90 | 3.9 |
| | High | 179 | 5.5 | 5.9 | 192 | 12.9 |
| Taverns and night clubs | Low | 25 | 6.6 | 0.8 | 8 | 0.2 |
| | Avg. | 80 | 8.6 | 1.4 | 18 | 1.1 |
| | High | 165 | 10.7 | 2.8 | 75 | 2.2 |
| Theaters | Low | 74 | 10.4 | 15.0† | 6 | 0.1 |
| | Avg. | 92 | 16.0 | 20.0† | 8 | 0.3 |
| | High | 115 | 19.0 | 30.0† | 12 | 0.8 |

*For lights and equipment †Cfm dehumidified air per person.

# UNIT CHECKING FACTORS FOR COMMERCIAL AIR CONDITIONING

From the large number of air conditioning installations that have already been made, sufficient operating data are available for arriving at general figures (Table 1) for classes of commercial installations. This information is not intended to replace the careful heat gain calculations necessary in a particular air conditioning design. These data do, however, enable an engineer to obtain a broad general picture with reference to the areas and number of persons generally served, range of size of unit commonly installed for such service, and required power consumption. These data can also be used as check figures to substantiate particular design calculations.

The information was obtained from analyses of actual load estimates and from other sources and compiled by Gayle B. Priester, Air Conditioning Engineer, Consolidated Gas, Electric Light and Power Co., Baltimore. In most cases, outside design conditions were 95F dry bulb and 75 or 78F wet bulb; inside design conditions were 76 to 80F dry bulb and 50% relative humidity.

When the watts per square foot are higher than average, or the square feet per person are lower than average, the total load usually is higher than average.

Since people, lights, and outside air usually account for the greatest part of the cooling load, except for living quarters or industrial applications, the data in Table 2 are given to show the important effect that a change in these items has on the total cooling load.

For the average application, approximately 1 hp per ton of refrigeration is required for the refrigerant compression equipment. When the predominant load, as in theaters and taverns, is due to people, a lower refrigerant temperature is required to remove the high latent heat load caused by moisture from the occupants. Therefore, more than 1 hp per ton is required. Similarly, when a large part of the cooling load is sensible heat due to transmission, solar radiation, or lights, a higher refrigerant temperature can be used and less than 1 hp per ton is needed. The supply air fan power requirement is about 0.1 hp per ton of refrigeration.

**TABLE 2—COOLING LOAD CALCULATIONS**

| Application or Item | Btu/hr = (1) × (2) | |
|---|---|---|
| | Quantity (1) | Factor (2) |
| Theaters | No. persons | 350 |
| Quiet offices or living quarters | No. persons | 400 |
| Active offices or retail stores | No. persons | 450 |
| Drug stores or restaurants | No. persons | 500 |
| Lights | Watts on in room | 3.4 |
| Outside air (at 95F db and 78F wb) | cfm | 43 |

Table 3 gives electric power consumption data based on actual installations analyzed for 95F dry bulb and 78F wet bulb conditions at about 40 deg latitude and near sea level. For different conditions and length of cooling season, these figures would have to be adjusted accordingly.

In addition to electric power costs, there usually are water costs. If a water-cooled condenser is used, then from 1 to 2 gpm of water per ton of refrigeration are required. The total water consumption cost for the season would be obtained by multiplying the total cooling load in tons by the operating hours from Table 3 times an average figure of 1.5 gpm times 60 minutes per hour times the cost per gallon (7.5 gal = 1 cu. ft). In other words,

Average water cost = tons cooling load × hours × 1.5 × 60 × cost of water per gal

or = tons × hours × 12 × cost of water per cu ft

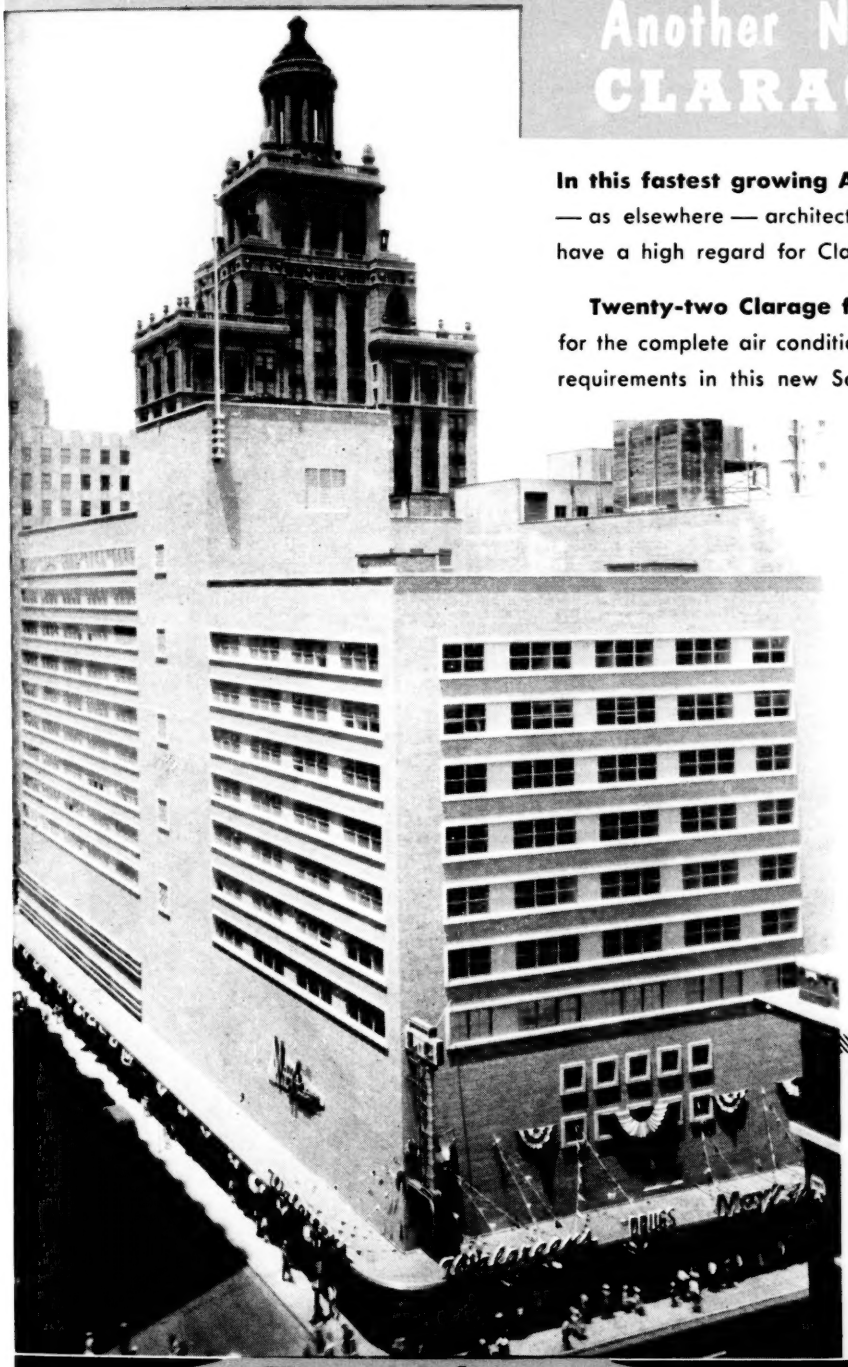
Installation cost of most air conditioning systems ranges from $300 to $1,000 per ton, the average cost varying for different applications and different localities. The cost per square foot of floor area varies from about $1 to $4.

**TABLE 3—POWER CONSUMPTION DATA—1947-48**

| No. Used | Class | Hp Range | Annual Kwhr per Hp | | | Equiv. Full Load Oper. Hours Avg. | Local (For your own figures) |
|---|---|---|---|---|---|---|---|
| | | | Range | 2-Yr. Avg. | Local (For your own figures) | | |
| 9 | Restaurants | 12-36 | 850-1,870 | 1,425 | | 1,620 | |
| 4 | Cafeterias | 11-21 | 770-1,365 | 1,124 | | 1,270 | |
| 15 | Drug stores | 3-13 | 516-2,101 | 1,021 | | 1,160 | |
| 5 | Jewelry stores | 5-9 | 565-1,180 | 840 | | 950 | |
| 8 | Night clubs | 15-47 | 410-1,190 | 827 | | 940 | |
| 9 | Dress shops | 5-45 | 354-1,085 | 770 | | 870 | |
| 11 | Residences | 3-11 | 111-1,229 | 661 | | 750 | |
| 11 | Theaters | 35-60 | 327-1,300 | 618 | | 700 | |
| 4 | Large offices | 45-60 | 490-1,018 | 547 | | 620 | |
| 7 | Ten-cent stores | 40-140 | 344-978 | 527 | | 600 | |
| 6 | Shoe stores | all 3.5 | 270-782 | 526 | | 600 | |
| 7 | Beauty shops | 5-8 | 287-745 | 510 | | 580 | |
| 4 | Small offices | all 5.5 | 264-580 | 441 | | 500 | |
| 6 | Recreation spaces | 25-65 | 276-651 | 421 | | 480 | |
| 9 | Funeral parlors | 10-18 | 108-572 | 187 | | 210 | |

# SAN JACINTO-HOUSTON

## Another Notable CLARAGE Installation



**In this fastest growing American city of Houston, Texas** — as elsewhere — architects, engineers, contractors and users have a high regard for Clarage fan equipment.

**Twenty-two Clarage fans,** handling 196,000 c.f.m., care for the complete air conditioning supply and exhaust ventilation requirements in this new San Jacinto building.

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**Yes, you can RELY on Clarage fan equipment** to meet your air handling needs with economy and satisfaction for a long time to come.

**CLARAGE FAN COMPANY**
**629 Porter Street**
**KALAMAZOO · MICHIGAN**

**ARCHITECT:**
*Kenneth Franzheim*

**MECHANICAL ENGINEER:**
*Reg F. Taylor*

**MECHANICAL CONTRACTOR:**
*Chas. G. Heyne and Company*

You can Rely on...

# CLARAGE

*Headquarters for Air Handling and Conditioning Equipment*

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • *IN CANADA:* Canada Fans, Ltd., 4285 Richelieu St., Montreal

# how Johnson temperature control

# *Automatically* attracts store traffic

Modern merchandisers recognize customer comfort as a key requirement in attracting maximum store traffic, the lifeblood of department store selling. Providing comfortable temperatures, for example, definitely helps bolster store traffic—and sales. In busy metropolitan areas, where downtown stores must compete with new suburban shopping centers, customer comfort is a "must".

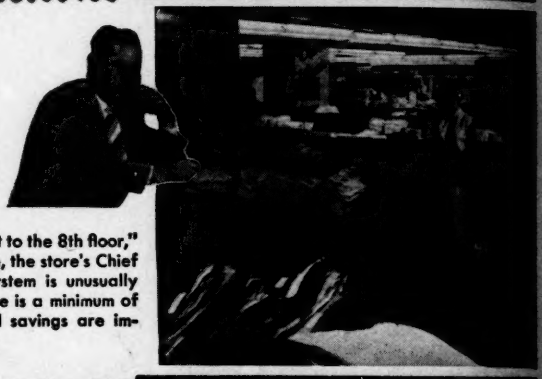
Scruggs-Vandervoort-Barney, Inc., is prominent on the growing roster of leading department stores that depend on modern Johnson Automatic Temperature and Air Conditioning Control to provide the ultimate in customer comfort.

With Johnson Control in command, heating, ventilating and cooling are under complete and precise control at all times. As patrons move from floor to floor or from section to section, uniform temperatures assure the best possible shopping atmosphere. When conditions demand, it is perfectly possible to cool a crowded interior section while perimeter areas of the same floor are being heated.

This accuracy and flexibility are typical of "Planned-for-the-Purpose" Johnson Control because each Johnson system *is specifically designed to meet the needs of the individual control problem.* That is why you will find Johnson Control not only in outstanding department stores, but in every other kind of public, business and industrial building.

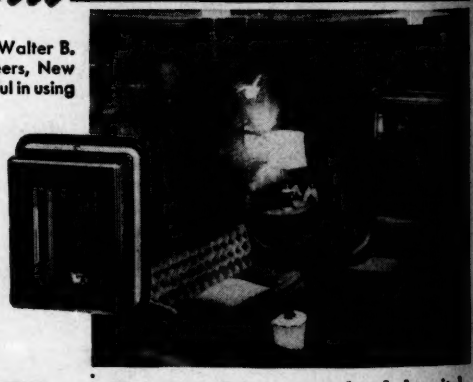
Take advantage of this efficient approach on *your own* temperature control problems. The experience of the nationwide Johnson organization is at your disposal without obligation. JOHNSON SERVICE COMPANY, Milwaukee 2, Wisconsin. Direct Branch Offices in Principal Cities.

Scruggs-Vandervoort-Barney, Inc., a leading St. Louis department store. Completely air conditioned, this modern store has all-year comfort control by Johnson.



"Johnson Control, a super-brain that no number of men could equal, keeps our temperatures uniform from the basement to the 8th floor," says Coy C. Leach, the store's Chief Engineer. "The system is unusually efficient, and there is a minimum of maintenance. Fuel savings are impressive, too."

Over 150 thermostats, 60 humidostats, 750 valves, and nearly 1,000 other items of Johnson apparatus operate as one efficient control system—and it's all automatic! From this panel in the machine room, 4 zone-control switches position all thermostats throughout the store for heating, cooling or ventilation.



Mr. Leo S. Weil and Mr. Walter B. Moses, mechanical engineers, New Orleans, La., were successful in using a minimum of valuable floor space throughout the store in planning this installation nearly 40 years after the store was built. Sodemann Heat and Power Co., St. Louis, Mo., were the mechanical contractors.

YOU, TOO, may be interested in a store, hotel, hospital, school, factory or office building. Let a nearby JOHNSON engineer help you solve your control problems on any new or existing building, regardless of size.

**JOHNSON** *Automatic Temperature and Air Conditioning* **CONTROL**

**MANUFACTURE • APPLICATION • INSTALLATION • SINCE 1885**